

# FLIGHT

The  
AIRCRAFT ENGINEER  
AND AIRSHIPS

Founded in 1909 by Stanley Spooner  
*FIRST AERONAUTICAL  
WEEKLY IN THE  
WORLD*

DEVOTED TO THE INTERESTS,  
PRACTICE AND PROGRESS  
OF AVIATION

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

No. 1330. Vol. XXVI. 26th Year

JUNE 21, 1934

Thursdays, Price 6d.  
By Post, 7½d.

Editorial, Advertising, and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1  
Telegrams: Truditor, Watloo, London. Telephone: Hop 3333 (50 lines).

HERTFORD ST., COVENTRY.

GUILDHALL BUILDINGS,  
NAVIGATION ST., BIRMINGHAM, 2.  
Telegrams: Autopress, Birmingham.  
Telephone: Midland 2970.

260, DEANS GATE, MANCHESTER, 3.

Telegrams: Iliffe, Manchester.  
Telephone: Blackfriars 4412.

26B, RENFIELD ST.,

GLASGOW, C.2.  
Telegrams: Iliffe, Glasgow.  
Telephone: Central 4857.

Telegrams: Autocar, Coventry.  
Telephone: Coventry 5210.

SUBSCRIPTION  
RATES:

Home and Canada: Year, £1 13 0; 6 months, 16s. 6d.; 3 months, 8s. 3d.  
Other countries: Year, £1 15 0; 6 months, 17s. 6d.; 3 months, 8s. 9d.

## India's Aircraft Needs

SOME weeks ago we commented on a speech by Mr. Tymms, Director of Civil Aviation in India, in which he drew attention to the special needs of an air line between Calcutta and Bombay, which the firm of Tata Sons, Ltd., propose to institute. The leading Bombay paper, *The Times of India*, has returned to the subject, and an article in its Engineering Supplement of May 31 sums up the qualities needed in a commercial aircraft for use to-day on the internal air lines of India.

The writer of this article has nothing to say about the trunk line which runs from England through India to Singapore. He is concerned only with the internal feeder lines. The Tata line has been running between Karachi and Madras for a long time, and the future plans of the company are mentioned above. The other company of importance is Indian National Airways, and India presents almost unlimited opportunities for its activities. Success depends on using just the right class of aeroplane for the job in hand. This is a maxim which applies to all commercial flying, but more particularly to India, where no Government subsidies are to be expected. The flying companies must keep expenses down to a minimum and yet must offer something really attractive to the public.

In the article referred to it is stated that the ultimate goal of any air line in India is "anywhere in a day." That, it is explained, means a range of 1,000 miles at a cruising speed of 140 m.p.h. The next consideration is one of size. The aeroplane must be neither too large nor too small. The "Puss Moth" has now become just too small. What is wanted at the moment is a machine which will carry 150 lb. more than the "Puss Moth" can carry. The machine needed may be described as a four-seater, though mails rather than passengers are the most desired cargo in the early days.

The article does not say that only metal machines will be acceptable. It does, however, point out that simplicity of operation and servicing are important, and that a machine which is likely to need very intricate overhauling, or require spare parts which are not easily obtainable, is not likely to find much favour. It has been the experience of British constructors in the past that an all-metal machine is likely to work out rather heavier than an aeroplane built mainly of wood, and also in most cases the cost has been found greater.

If India is prepared to accept aeroplanes of wood or composite construction, there should be no great difficulty in obtaining British machines to meet the requirements. On the basis of the article in *The Times of India* it is scarcely possible to put forward a detailed argument. So much depends upon what the operator wants. If he is willing to use single-engined machines he will probably save something on first cost. If his route is such that forced landings must be avoided he will almost certainly have to pay for this in the form of using machines with one or more engines. Aircraft operation is very largely a compromise, and the "ideal" machine for any given route is rarely achieved. It is the fashion in many quarters to say of the British aircraft constructor that he is unwilling to put himself out to "give the customer what he wants." The expense of producing a new type of aircraft to meet certain specific requirements is relatively heavy, and if the potential market for that type is likely to be strictly limited, the manufacturer may well be excused if he does not consider it worth his while to run the risk. The range of British aircraft available is already large, and is growing almost every week, and the operator in India and elsewhere would do well to remember that by compromising a little between what he would like (and for which he can probably not afford to pay) and what is to be had in standard types at small cost, slightly modified to suit his needs, he has many types from which to choose.

## Retractable Undercarriages

**R**ARELY in the history of flying has any new idea been adopted without a struggle against prejudice and opposition. In a few instances opposition has been due to mere "conservatism," but generally speaking there has been good solid technical grounds for it. A case in point is the retractable undercarriage. Ill-informed critics have in the past blamed British designers for being tardy in adopting this apparently obvious aid to drag-reduction. Recently, however, there has been almost a spate of new types in which the retractable undercarriage is an important feature of the design. On the surface, the advantage of tucking the undercarriage away inside some other part of the aeroplane and thus saving its drag is so obvious that it is understandable if some impatience has been felt at delays in its general adoption. The matter is not, however, quite as simple as it looks.

To begin with, the mechanism necessary for raising and lowering the undercarriage must of necessity add some extra weight, as well as a certain amount of complication. These two considerations are fairly obvious, and although used some years ago as an argument against the retractable undercarriage, they are not, and were not, the main reasons. A glance at the front elevation of any aeroplane soon reveals

the fact that to move the wheels into any other part of the aircraft than the wings is a complicated business. It can be done and has been done, but the wing is the obvious place. Until a very few years ago, nearly all British aeroplanes were biplanes. It would form a long subject to enter here into the reasons for this preference on the part of British designers, but the fact must be recalled. The lower wing of a biplane is too thin to act as a housing for the retracted wheels, and it was not until the low-wing monoplane became popular that the retractable undercarriage made much headway.

It is logical to ask why there was the delay in adopting the low-wing monoplane arrangement. The answer can be given quite shortly by pointing out that in the earlier days it was found that the low-wing monoplane was slightly less efficient than the high-wing. For a time we had no very sound explanation for this fact, but as aerodynamic science progressed it was found that the difference in drag was due to what has now become known as "interference." Non-technically explained this consists in an upsetting of the air flow by placing two surfaces at right angles to each other and diverging. Once this fact was realised, means were soon found (by large "fillets" and otherwise) of reducing interference, and now the low-wing monoplane is as efficient as any other wing arrangement. Thus the way is open for the retractable undercarriage.

14287



**GETTING UPSTAIRS :** Rapid climb is a first consideration in an interceptor fighter. The Hawker "High-speed Fury" is seen here on its way upwards. The engine is a steam-cooled Rolls-Royce "Goshawk" 12-cyl. Vee type. This machine will be seen in public for the first time at the R.A.F. Display at Hendon next Saturday. (FLIGHT Photo.)



# The Outlook

## A Running Commentary on Air Topics

### Improving the Air Mail

**R**EDUCTION in the Air Mail Rates was asked for in a very well-reasoned article by Rear-Admiral Sir Murray F. Sueter in *FLIGHT* of May 17 last. Sir Murray, it will be remembered, is chairman of the Parliamentary Air Committee. Recently the Postmaster-General received a deputation from the London Chamber of Commerce, the Association of British Chambers of Commerce, and the Federation of British Industries. The purpose of the deputation, set out in greater detail on page 607 of this week's issue, was to get something done about the present unsatisfactory state of British air mail services. The deputation held the view, also shared by Admiral Sir Murray Sueter, that first-class Empire mails should be sent by air at as low a flat rate as possible. The international difficulties were admitted to be considerable, but it was urged that air mail to parts of the British Empire should be sent at a flat rate of either the international 2½d. per oz., or, if that were not feasible, to give correspondents the option of the existing rate of 1½d. per oz. by the surface route or a higher flat rate by air.

Whether or not these actual figures are practicable may be doubtful, but it is all to the good that an agitation should be undertaken by the business communities of the country to secure improvements. The present rates are so high as to discourage very many correspondents from making full use of the Air Mail.

### Speeding-up

**A**NOTHER plea advanced by the deputation was for a higher average speed over the air mail routes. It was pointed out that at present it takes five days to get mails from London to Karachi and London to Nairobi by air, the distance in both cases being approximately 5,000 miles, or an average of 1,000 miles in 24 hours. Sir Geoffrey Clarke, Chairman of the Council of the London Chamber of Commerce, recalled that in its representations to the Secretary of State for Air the London Chamber had submitted that the air mail should travel at least 2,500 miles per day. There is, of course, no harm in aiming high, but it may be pointed out that so long as flying is confined to daylight hours, this would mean a route speed of something like 200 m.p.h. The cruising speed necessary to maintain such a schedule would have to be considerably greater. We fear that the business community would not be prepared to pay a flat rate commensurate with quite such a high operational speed, although *FLIGHT* has frequently pointed out that by using machines specially designed for mail carrying, and with no passenger accommodation, there is no technical difficulty in approaching that ideal, *if we are prepared for pay for it.*

### Frequency of Service

**W**ITH the final recommendation of the deputation, that a twice-weekly British air service to the East and to South Africa, would be a boon, few will disagree. It is only necessary to take an extreme case in order to see how important is frequency of service. For example, let us suppose that an air mail machine were in existence which would do the distance London-Cape Town in one day. That would be marvellous, wouldn't it? But if that machine cost so much to run, or for other reasons could not be flown over the route more than once every six weeks, then only that minute percentage of correspondents who wished to send letters round about the day of departure of the machine would use the service. The rest of the mail would go by surface transport. It would be very splendid for a few, but of no interest at all to the majority. It has ceased to be wonderful that one can go to Cape Town in nine days or so once a week. If one could go there in a week, starting on any day of the week, the service would be used much more extensively, and would again arouse enthusiasm.

### Killing the Goose

**I**T is an unpleasant fact that most of the lay individuals who go to a flying display come away feeling that they have been persuaded to go under false pretences and confess, in fact, to a considerable feeling of boredom. They go to see flying and more flying and are often given what they want in minute doses, each one sandwiched between agonising and doubtfully musical intervals. It can only be pointed out that the people who organise dull shows will kill the goose that lays the golden egg—and the egg can, even now, be a surprisingly small one.

The first essential is an announcer who really knows his job. In a recent event he could not even tell the difference between quite well-known types of aircraft. He must hold the attention of a crowd while the aerobatic pilot, for instance, is climbing to his "aerobatic" height, and remember not to talk too much about things remote from the subject. If there are gaps in the programme—well, pilots would be only too pleased to demonstrate the interesting types in the "machine park"! The initially interested crowd simply must *not* be bored.

### Ground Organisation is Important

**C**OMPLAINTS have reached us from time to time, showing that some operators who have started internal airlines in this country have not grasped that elementary fact that theirs is a transport undertaking and not primarily a flying concern. They should remember that their duty to the public begins at the booking office at the place of departure, and does not end until the terminal town is reached. Unfortunately some operators do not appear to realise this, with the result that we hear of aerodromes without waiting rooms or restaurants, a lack of transport between the aerodrome and the town, and schedules so easily disorganised that the services become irregular or even non-existent immediately there is any kind of hold up or delay.

Airlines are run for the public they carry and not for the satisfaction of the operating company and its pilots. In the early days there was some small excuse for the attitude "the public don't matter," but those days have passed, and if air transport is to be built up on sound foundations the public must invariably be considered as of paramount importance, and the ground organisation of an airline must rank equal with, if not more important than, the flying organisation.

### Low Flying

**H**ISTORIC buildings like cathedrals, churches and old country houses can admittedly be seen far better from the air, and there is, therefore, a great temptation for pilots to fly low in their vicinity. A recent Air Ministry notice draws attention to the irreparable damage which these buildings would suffer if an aircraft were to collide with them. Pilots are, therefore, requested to exercise particular care.

### Payment for Speed

**"A**LL that air transport has to offer the public is speed" is a parrot cry which has been echoed for so long that people are apt to overlook the price which may have to be paid for speed. Imperial Airways have, in the face of opposition, maintained that the comfort of their passengers was equally as important as the speed at which they were carried. That their policy is right has been amply proved by the increase in their traffic. Single-engined super-high-speed machines may be very satisfactory for the carriage of mails, but are not likely to be an economical proposition for the transport of passengers. These latter will not stand being boxed up in a small space and subjected to terrific noise solely so that they can travel somewhat faster than they could in the slower, but infinitely more comfortable, multi-engined aircraft of the kind which Great Britain favours for its airlines. Operators should remember this and confine the use of the former type of aircraft to the carriage of mails.

# R.A.F. Flying Club's Display

*Fine Flying by Members of the Royal Air Force Flying Club at Hatfield, in the presence of H.R.H. Prince George*

**S**PECTATORS at the first meeting of the Royal Air Force Flying Club, on Saturday, saw some of the finest flying it has been our pleasure to witness. Last year when the Club held their meeting the membership was confined to members of the R.A.F. Reserve, but recently it has been extended to include past and present officers of all the Flying Services in the country, including ex-R.N.A.S. and R.F.C. Officers and past and present members of the Air Squadrons of both Oxford and Cambridge Universities, and the number of members has therefore grown very considerably.

Their meeting this year was graced by the presence of H.R.H. Prince George, who arrived by air from Reading exactly at the announced hour of 4 p.m. He was accompanied by Maj. H. Butler, and was flying in a D.H. "Dragon" (two "Gipsy Majors"), the property of H.R.H. the Prince of Wales, piloted by Flt. Lt. E. H. Fielden. On the aerodrome to welcome the Prince were Marshal of the Royal Air Force Lord Trenchard, President of the Club; Lt. Col. F. C. Sheldermine, Director of Civil Aviation; Capt. G. de Havilland and Sir Harry Brittain, Vice-Presidents of the Club; Marshal of the Royal Air Force Sir John Salmond; P/O. R. E. G. Brittain, Chairman of the Club's Committee; F/Os. W. A. Hammerton and A. G. Lamplugh, Vice-Chairmen of the Committee.

After a preliminary event, wherein members of the four R.A.F. Reserve Training Schools competed in a "Bombing the Car" contest, the main programme was opened by a display of formation flying by Nos. 600 and 601 (Bomber) Squadrons of the Auxiliary Air Force, commanded by Sqd. Ldrs. S. B. Collett and N. Norman. Excellent flying and accurate changing of formation while over the aerodrome were seen, and once again the A.A.F. proved that their flying is quite up to the standard of the R.A.F. itself.

Event II was both amusing and instructive. F/O. T. W. Campell went through a series of manoeuvres as they ought to be done, and then Sgt. Pilot W. L. Palmer attempted to imitate him in the clumsy manner of an inexperienced pupil. Both are instructors of the Bristol Aeroplane Co's. School and were flying "Tiger Moths."

Event III was a display of the Gloster "Gauntlet" (Bristol "Mercury") by F/O. P. E. G. Sayer. The machine has been chosen as the standard day and night fighter in the R.A.F. It has an exceedingly high performance and has not been seen very much in public. F/O. Sayer showed off its wonderful manoeuvrability in an admirable manner, particularly by demonstrating repeatedly its unusually small turning circle, even when flying at speeds of about 200 m.p.h. The "Mercury" engine had an impressive lack of noise when it was running, quite unlike other high-powered engines used in Service aircraft, and gave a sense of suppressed, but readily available, power. The beautiful manner in which F/O. Sayer carried out slow rolls, although climbing to a very steep angle, was a joy to see.

Event IV was inverted and aerobatic flying on an Avro "Cadet" (Sidleley "Genet") by an instructor from the A.S.T. School at Hamble, F/O. A. J. Tunnard. The "Cadet" is one of the most beautiful light aeroplanes to handle, and F/O. Tunnard showed that it is capable of all the ordinary manoeuvres of fighting aircraft which have engines of much greater horse-power and that it is, therefore, an excellent machine for training. Having only 140 h.p., his performance was naturally not so spectacular as some of the others, but was none the less smooth, and exhibited his control of this machine.

Event V, which took place shortly after the arrival of the Royal party, was a change, because the aeroplane used was only a means to an end. It, the aeroplane, was one of the new Stinson four-seater cabin monoplanes replete with every device which is calculated to make the comfort-loving business man use the air for his dollar-making journeys. On this occasion Mr. Leslie Irvin, the owner, was flying it, and in the back, with one of the cabin doors removed, he had Mr. J. Trantum ready to demonstrate one of the parachutes which have made the name of Irvin famous throughout the world. The demonstration was to take the form of a delayed drop, so after taking off, Mr. Irvin, also wearing one of his parachutes, as is his invariable custom, climbed his Stinson to a fairly high altitude. Then when placed up-wind with regard to the aerodrome, Mr. Trantum dived out of the cabin. Following, there was a somewhat agonised wait while he fell a thousand feet or so before a gasp of relief went up when he decided that he had delayed long enough and therefore pulled his rip cord. He had



ON HATFIELD'S TERRACE :  
(Left to right) Lady Trenchard,  
F/O. W. A. Hammerton, P/O.  
R. E. Brittain, H.R.H. Prince  
George, Capt. A. L. Lamplugh,  
Sir Harry Brittain.

(FLIGHT Photo.)



**THE ROYAL ARRIVAL :** (Left to right) Lt. Col. Shelmerdine, Director of Civil Aviation; Sir John Salmond; Lord Trenchard, President of the R.A.F. Flying Club; Prince George and Maj. H. Butler. (FLIGHT Photo.)



opened his parachute some considerable height above the ground, so the descent took quite a long time, during which the spectators were able to see the manner in which he endeavoured to make sure of a landing inside the aerodrome by spilling air out of the canopy and side-slipping in the desired direction. Unfortunately, he had not allowed quite enough for the strength of the wind, and consequently he landed just outside it, beyond the ground where the new de Havilland Aircraft Factory is being built.

Event VI was heralded in with a full-throated roar which must have reverberated around the country for miles when Flt. Lt. P. W. S. Bulman, chief test pilot to the Hawker Aircraft Company, opened up the R.R. "Kestrel VI" engine of his Hawker "Hart." The resulting take-off was almost "helicopterish," and gave proof not only of the efficiency of this aeroplane, which is widely used in many guises in the R.A.F., but also of the reserve of power it has in the "Kestrel" engine. Further proof of this power reserve was given later on in the demonstration when Flt. Lt. Bulman flew across the aerodrome, at what must have been little more than 50 m.p.h., with the engine just lazing over; as he reached the spectators he opened up the throttle wide and immediately put the "Hart" into a very steep climb. It fairly jumped at it like salmon going up a leap—or, perhaps a better simile would be, like a hart going over a fence. We have seen "George" Bulman's flying displays for many years and we know, perhaps better than most, his wonderful skill—many of our finest air photographs have been taken with his help—but never have we seen him put up a more finished display than he did last Saturday. He was superb. Time and again he showed perfect judgment when diving almost vertically at the aerodrome and flattening out his "Hart" with the smoothness and gentleness of a fly-fisherman playing a large fish on fine tackle. Once when carrying a vertical climb to its limit he stopped his airscrew, but, whereas a less skilled pilot would have had to land, "George" had that airscrew turning again at once

with a perfectly-judged steep dive which still allowed him room to climb away again and continue his display. The pity of it was that the sun had by this time got almost opposite the spectators and he had difficulty in keeping out of it so that they could see his flying.

Event VII provided a contrast to the previous event. Two instructors of the de Havilland School of Flying, F/Os. G. S. King and V. R. Moon, took off to give a lurid and very hair-raising exhibition termed on the programme "Eccentric Aerobatics." They were! Their "Tiger Moths" were put into every conceivable position which, had we not known who they were, would have condemned them as the world's worst and most dangerous pilots. We can only hope that their pupils do not try to emulate flying like that.

Event VIII was something different from the others. F/O. R. A. C. Brie demonstrated the latest type C.30 direct-controlled Autogiro. He started by taking off and landing in the same manner as a pilot would be able to do had he an aeroplane with an unusually wide speed range. Then he showed what an Autogiro really can do when the pilot wants to use its powers to the full.



**FAMILIES AT HATFIELD :** On the left, Marshal of the Royal Air Force, Sir John Salmond, with his family. In the centre, Mrs. de Havilland and Mr. Peter de Havilland are standing, while between them, seated at the table, are Mrs. Geoffrey de Havilland and Capt. de Havilland. On the right is seated Group Capt. R. Leckie, Superintendent of R.A.F. Reserve, with Mrs. Leckie. (FLIGHT Photos.)

Finally, to confute the critics whom, so it was said, were sceptical as to whether the Autogiro in its present form could be landed under perfect control without the use of the engine, he went up fairly high and stopped his airscrew completely. He came down and landed without the slightest trouble, exactly where he wanted to, right in front of the enclosures, and did so very gently without any forward movement. If proof were needed that the Autogiro is one of the greatest advances in the science of aeronautics, there it was, and there was no doubt that the spectators appreciated this fact.

Event IX provided the finest and most perfect flying we have seen, or are likely to see, for a very long time. Flt. Lt. J. B. Veal and F/O. J. Beaumont, both instructors of the A.S.T. School at Hamble, gave a demonstration of inverted flying and aerobatics in two of the School's Avro "Tutor" aeroplanes with "Lynx" engines. Their synchronisation was perfect. Their slow—very, very slow—rolls when in line astern were done as one machine and, in fact, throughout the whole display we never once saw either pilot start or finish a manoeuvre after the other. Their perfect accuracy and brilliant handling of those aeroplanes must naturally draw attention to the training given at Hamble.

Event X, the last on the programme, was a display of synchronised aerobatics by Sgt. Pilots S. W. Bannister and S. Wroath of No. 1 (Fighter) Sqd., R.A.F., from Tang-

mere. Their display, in Hawker "Furies" (R.R. "Kestrel"), was in every way what we have now come to expect from our efficient Royal Air Force equipped with efficient aircraft.

Throughout the afternoon the programme was made easier to follow, particularly for those whose knowledge of aircraft and aircraft manoeuvres was not very extensive, by the clearly-spoken broadcasting of Mr. Nigel Tangye. When he was not talking, the band of the R.A.F. (Henlow), under the direction of Bandmaster H. H. Ingram, provided music, well chosen and appropriate to the occasion. In one of the D.H. hangars there was housed a display which had been arranged by Imperial Airways. Photographs and diagrams illustrated a great deal of the work this company is doing, but we felt that better use might have been made of the space available to show people more about the time saved by flying to places abroad as compared with surface means of transport.

A final word must be said in tribute to the catering staff of the Hatfield clubhouse restaurant. Getting meals at flying meetings is often a question of "he who shoves most and shouts loudest" may get something. But there was nothing like that on Saturday. Everything was perfectly arranged and the guests were made most comfortable. Even the car-parking arrangements and the traffic control call for no criticism—truly it was seeing flying in perfect conditions.

C. N. C.

## IMPROVED R.U.S.I. EXHIBITION

### *Excellent Models of Military and Civil Aircraft*

SEVERAL improvements and additions have lately been made to the aeronautical section of the Royal United Service Institution in Whitehall. The revised section was reopened to the public on June 19. We have already recorded that the Royal Air Force section is now regarded as being equally important as the sections devoted to the other Services.

The aeronautical section consists mainly of models, pictures and articles having some connection with the development of aviation. Models are arranged in large illuminated glass cases, in chronological order, and under various titles. The "scenery," in each case, is appropriate. That in the R.N.A.S. exhibit represents the bombardment of the Belgian coast. One cannot help imagining the effect that the employment of large flying boats like the "Perth" and "Iris," of which there are models, would have had on this event. Models of the Sopwith "Bat" boat of 1913 and of the F.5 flying boat are included among the "Coastal Types."

Under the title "Army Co-operation" come the A.W. "Atlas II," Avro "Aldershot," Vickers "Victoria" and Autogiro C.30 P. The title is rather unfortunate, for although the "Victoria" and "Aldershot" may have co-operated with the Army, they are not "A.C." types in the official sense. The landscape in this case has been well sprinkled with tanks, armoured cars and military transports. It is unfortunate that the Autogiro bears civil registration letters, but this serves to remind one that the use of this type of aircraft for Army Co-operation work is but a recent development.

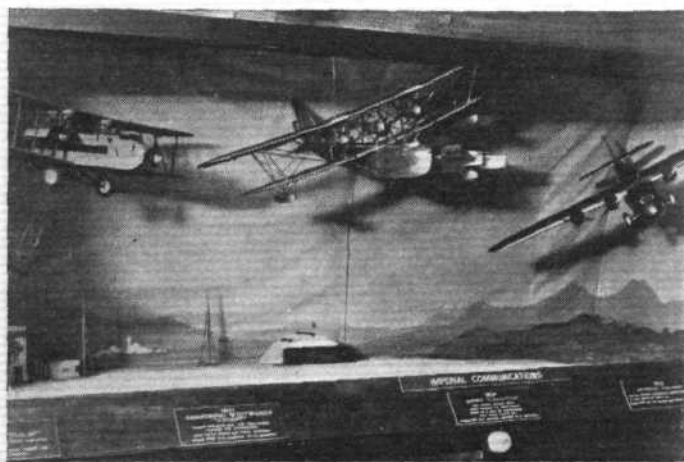
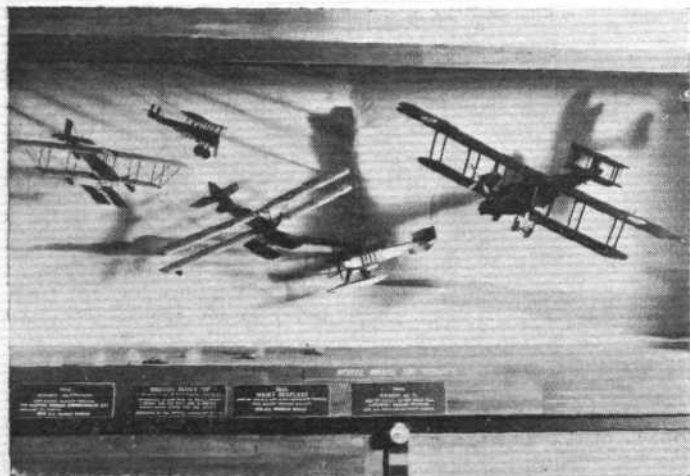
"Fighters and Bombers" are represented by two models of machines of each type—"Bulldog," "Fury," "Fox"

and "Hart." While regarding this exhibit we regretted that it is not possible to alter the models, as their prototypes are modified. One must remember, however, that one of the main objects of the exhibition is to show progress, and for this reason each machine is labelled with the date of its production. In any case, we doubt if many visitors will remark that the "Bulldog" model retains its spinner and has no brakes and tail wheel, or that the "Fury" is without a cross member between the centre-section struts.

Probably the most comprehensive of the sections is that containing models of R.F.C. types in which the early Sopwith Tractor, Avro 504K, B.E. 2C, Vickers F.B. 5 ("Gunbus"), R.E. 8, D.H. 9, Sopwith "Snipe" and S.E. 5 are represented. R.N.A.S. equipment is commemorated by models of the 1912 Short seaplane, Bristol "Scout" "D," Short 225, Fairey III D, Handley Page 0/400 and Bristol Fighter.

Blackburn "Dart" and "Ripon," Fairey III F, Hawker "Nimrod" and Vickers "Vildebeest" are classed as Fleet Air Arm types, although the "Vildebeest" is used by the R.A.F. only for coastal defence work.

Late additions to the model collection include the Short R. 6/28 (six R.R. "Buzzards") and some civil types—the "Argosy," "Calcutta," Spartan "Cruiser" and "Atalanta." "Historical and Pioneer Types" range from Lana's "flying boat" of 1670 to the Blackburn monoplane of 1909. Photographs depicting the damage caused by enemy aircraft to well-known London buildings and streets is another innovation. Then there are a number of coloured enlargements of FLIGHT photographs. Actual examples of bombs, bomb racks, guns and souvenirs of aerial warfare complete the exhibition.



AT THE R.U.S.I.: Two cases of models representing machines used by the R.N.A.S. (left) and some recent commercial types (right). (FLIGHT Photos.)



# COMMERCIAL AVIATION

## — AIRLINES — AIRPORTS —

### THE ROYAL AIR MAIL PENNANT

*Presentation Ceremony at Heliopolis Aerodrome*

**A**N interesting and historical ceremony took place at Heliopolis aerodrome on June 7, when His Excellency, The High Commissioner, Sir Miles Wedderburn Lampson, K.C.M.G., C.B., M.V.O., presented the Royal Air Mail Pennant to Imperial Airways, Ltd. The first Royal Air Mail Pennant, it will be remembered, was presented to the Chairman of Imperial Airways, Ltd., Sir Eric Geddes, at Croydon, by the Postmaster-General, Sir Kingsley Wood, on May 26 last.

H.E. The High Commissioner arrived at the aerodrome at 5.30 p.m. and was met by Air Vice Marshal C. L. N. Newall, Air Officer Commanding, Royal Air Force, Middle East, Group Capt. W. H. Pulford and Mr. B. C. H. Cross, Manager, Near East Area, Imperial Airways, Ltd. A guard of honour was supplied by the Royal Air Force under the command of Flt. Lt. Fitch. On the platform with His Excellency were many of the Cabinet Ministers, including H.E. Mohamed Naguib el Gharabli Pasha, H.E. and Mrs. Salib Samy Bey, H.E. Mohamed Sadek Younes Pasha, H.E. Hussein Sirry Bey, H.E. Ibrahim Fahmy Karim Pasha, H.E. Ahmed Kamel Pasha.

Before breaking the Royal Air Mail Pennant, His Excellency made a short speech, in which he stated that 1934 was the tenth anniversary of the formation of Imperial Airways, Ltd., and that since 1924, when only short European routes operated, the services had now been extended from London to Singapore and London to Capetown, this extension being accompanied by a very high degree of regularity. With experience, faster schedules are now being flown and H.M. mails punctually delivered. In his opinion the far-sighted policy of the Egyptian Post Office, and the inauguration of the experiment by the Egyptian Postmaster-General, by which letters to Great Britain and Europe could travel at the same cost by air as by sea, was a stepping stone which will indicate how far public opinion has gone towards the carriage of all mail by air. He was pleased to hear that the experiment was meeting with considerable success.

He said that he observed that Egypt was fully alive to its important geographical position which gives her the opportunity of being the great air-route junction between Europe, Asia and Africa, and that in the future she may expect to reap the harvest from the seeds which are now being sown in the form of airports, wireless and air navigational aids.

He added that the development of the national Egyptian air line had already earned a reputation for safety, regu-



**THE PENNANT IN EGYPT:** Sir Miles Lampson, High Commissioner at Cairo, inspects the crew of the Imperial Airways airliner *Horsa*, after presenting the Royal Air Mail Pennant. Later he went up for a flight over Cairo.

larity and efficiency, which further shows the progress being made in Egypt in air developments.

In thanking His Excellency, on behalf of Imperial Airways, Mr. B. C. H. Cross stated that this event might be regarded as the second historical milestone in the progress of Imperial Airways' activities on its overseas routes, and in particular in Egypt. The first milestone was connected with a ceremony which occurred early in 1927, when H.M. King Fouad christened the first airliner which was to operate between Cairo, Baghdad and Basra. This was the first service Imperial Airways, Ltd., commenced outside Europe, and it was the beginning of the route which was eventually to be extended from London to Singapore, and finally in the other direction to Capetown.

Imperial Airways, he said, were very proud of their regularity, to which His Excellency had referred, and perhaps there was no better test of regularity than the passing of the aircraft through Egypt. He made this clearer by mentioning that the aeroplanes arriving in Egypt from Singapore on their way to London had already flown 6,000 miles, whilst the aeroplanes from the Cape had flown 5,500 miles. Similarly, those from Great Britain flying both east and south had flown 2,400 miles.

At the conclusion of the speeches, His Excellency, accompanied by his daughter, niece, and Egyptian Ministers, took a short flight over Cairo in the airliner *Horsa*, after which he made a tour of the airport, including the workshops and hangar.

#### RHODESIA-NYASALAND AIRWAYS

AUTHORISATION has been received by Rhodesia-Nyasaland Airways, Ltd., from the Portuguese Government to operate services between Beira and Blantyre and Beira and Salisbury. Other means are being considered to connect Angola with the British Cape to Cairo air route.

#### AMERICAN AIR LINES, INC.

RECENTLY formed by the Cord interests to take over American Airways in order to compete for the new air mail contracts, American Air Lines, Inc., is now presided over by Mr. L. B. Manning, with Mr. L. D. Seymour as Vice-President.

## CROYDON



**A SPEEDY VISITOR :** The Heinkel H.E. 70A (630-h.p. B.M.W.) which gave demonstration flights at Croydon on Monday. It has a top speed of 230 m.p.h. and a cruising speed of about 200 m.p.h. The wheels fold outwards, into the wings.

**I** SHOULD be content to make no further mention of the radio beacon mast tragedy. Others thrust the matter upon me. In reply to a question in Parliament it was stated that the decision had *now* (italics are mine) been taken to reduce the mast in height, although that entailed abandonment of its possible use for long-range navigation. The above remark deserves comment. If the mast was ever needed for long-range work it should have been erected on Mitcham Common, where it would not have endangered traffic. If it is wanted for that purpose in the future, why make a reluctant virtue of lowering it now? Why not remove and re-erect it elsewhere where it would be just as efficient as it always has, or has not, been? At a certain meeting last January, however, it was the unanimous opinion of airline pilots of various nations that the European airline pilot had no need for the American system of being put on invisible rails between airport and airport. He is a trained cross-country pilot and weather does not worry him. All he needs is a short-range beacon to help him find the actual landing field. Hence it was suggested the mast could be lowered even though its range was lessened.

Some armchair expert recently asked why the wireless beacon was any more an obstacle than the equally high mast on the control tower. Answer: Because the control tower is not 8 deg. off the compulsory fog landing line of white chalk. By the way, the mast is now down. Press photographers were not allowed to photograph the work in progress. Why?

During last week there was a non-stop ambulance aeroplane flight from Zurich to Croydon by a Swissair Fokker F.VII B. Several small French taxi-planes also brought polo players to Croydon one morning, to play in a match the same afternoon. A young man aboard the *Olympic* from America found the ship was to berth at Cherbourg instead of Plymouth. This mid-Atlantic change of plan upset his schedule. He wirelessed Imperial Airways, who had a taxi plane to meet him at the French port. The ship docked at 6 a.m. and he left at 7 a.m., arriving Croydon 8.45 a.m. for a bite of breakfast. He was

then flown to Cambridge, landing there 9.45 a.m., in time for an important examination commencing 10 a.m. I hope he passed with "flying" colours. Mr. "Bill" Bailey, of Air Charter, Ltd., flew a doctor to Dublin from here on Thursday. An urgent operation was successfully performed and the return flight was made on Friday.

Olley Air Service started what should be a popular innovation. Evening coast cruises from Croydon via Whitstable, Ramsgate, Margate, Deal, Dover, Hythe, and back over the Kentish hopfields. About 150 miles are covered in 1½ hours and the cost per passenger is only 32s. 6d. Unlike the Air Circus, which does absolutely nothing to turn people into air travellers, and has, indeed, the opposite effect very often, this enterprise of Olley Air Service is definitely helpful. People with a wholly unreasonable fear of the effects of air travel, based as a rule on the experience of some friend ten years ago, can make one of these trips and return reassured. People who cannot afford to travel to the Continent, even though "air" is the cheapest way, need not miss the beauties of the coast scenery and of the English countryside seen from the air. Incidentally, evening is the best time of day for absolutely smooth air travel.

I saw a fully loaded Imperial, an Air-France with some ten passengers aboard and a Royal Dutch with between ten and fifteen passengers, all land one after the other one day last week. Between fifty and sixty passengers proceeded to wait whilst the luggage was unloaded and cleared through Customs. During the pause between disembarkation and actual clearance of baggage, all the passports could have been examined. Ten to fifteen minutes delay could be avoided on such occasions if facilities existed for passport examination during baggage unloading.

Prince Gustav Adolph of Sweden arrived by K.L.M. "Scandinavian Air Express" on Sunday. He will ride at the International Horse Show, Olympia.

By the outward Scandinavian machine the same day the Hon. Ruth Bryan Owen, U.S. Minister to Denmark, flew to Copenhagen.

A. VIATOR.

## HESTON

**M**R. RODERICK DENMAN, aeronautical wireless specialist and Technical Director of Airwork, Ltd., paid a visit to Amsterdam in the early part of last week at the invitation of the K.L.M. authorities. Mr. Denman, who is making a close study of the experimental radio-assisted landing systems now being tried out in Europe and the United States, inspected the landing beacon installed at the airport of Amsterdam, and subsequently took part in hooded flights over the

beacon which effectively demonstrated its capabilities. Mr. Denman states that in two years the Dutch will have eight beacons of this type in operation. Before leaving Holland, he paid a visit to the Phillips' factory at Hilversum, where another type of beacon, operated by sound-film apparatus, is undergoing tests.

Thirty-one employees of the Midland 'Bus Company were brought to Heston on Wednesday in one of their own motor-coaches for a taste of flying. They were in charge



of Mr. W. Cooke, who was a war-time pupil of Capt. V. H. Baker (Airwork Chief Instructor) at Cramlington. All of them took joyrides in a Wrightson & Pearse "Dragon," and spent a very pleasant afternoon inspecting the airport.

Strawberries and an old lady of eighty-six were among the payloads carried by Heston aircraft during the week. Eighty-three lb. of the former arrived from Jersey in good condition on June 8 and were delivered to a Covent Garden merchant. The old lady, having already flown from the Orkneys, made the return trip to the Isle of Wight by P.S. & I.O.W.A., Ltd., in one day, and vows she will never again travel otherwise than in the air. Her wheeled chair was carried on the aircraft, and this enabled "terminus fatigue" (the worst part of railway and sea travel) to be reduced to a minimum.

Officials in the new Traffic Hall handled, during the week ending June 13, 174 arrivals and departures of aircraft for the Continent and commercial inland traffic.

### CHESTER

REFERENCE has been made by the Town Clerk to the site for an airport previously reported upon by the Air Ministry as being the most suitable site for an air park. He had been informed by the owner of part of the land that offers for its purchase for building development had been made, but he did not wish to take action until he knew whether the Corporation desired to reconsider the matter. A resolution was passed stating that an aerodrome was desirable for the future well-being of the city.

### CORK AS AN AIRPORT

At a recent meeting of the Joint Committee representing local bodies which has been set up to examine proposals for the establishment of an airport at Cork Harbour, letters from air traffic companies were read. One, from K.L.M., said that Cork, geographically, would be one of the most

Private inland traffic is, of course, not required to "clock in" at the office, although the control officer registers all arrivals and departures from his tower. Portsmouth, South-sea & Isle of Wight Aviation, Ltd., has carried between Heston and the Isle of Wight, in the first fortnight of June, over five times as many passengers as in the corresponding period of May. At week-ends they are now working to 90 per cent. capacity. Last week 1,020 passengers were carried between Portsmouth and Shanklin, and 130 on the Heston-Shanklin service.

Four Miles "Hawks" from Reading made a return trip to Le Zoute on June 10, piloted by Messrs. Dimock, Spratt, Cliff and Uberoi.

The regular traffic control which was instituted at Heston some little while ago has already justified itself, as a few days ago there were 592 aircraft movements (take-offs and landings) in the 10½ hours during which the control was operated.

suitable connecting places between future Atlantic services and European Continental airlines. The company intimated that they had already prepared to operate a service to Cork in the event of landing facilities being provided. Imperial Airways stated that so far as internal air services within the British Isles and Ireland were concerned, Cork to London unquestionably was one of the most attractive routes. Deutsch Luft Hansa said that if Cork Harbour had a good connection for the regular use of air services it would have a special attraction, if up-to-date facilities were provided. It was estimated by Mr. O'Connor, the County Surveyor, that £20,000 would be needed for the reclamation of the Belvelley site, while, in addition, £30,000 would be required, later on, for the erection and equipment of an aerodrome. He suggested that, of the first £20,000, Cork Corporation should provide £5,000, Cork County Council also £5,000, and the Government £10,000.

## IMPERIAL AIR MAIL SERVICES

### *Deputation to the Postmaster-General*



DEPUTATION, on the subject of Imperial Air Mails, from the London Chamber of Commerce, the Association of British Chambers of Commerce and the Federation of British Industries, was received by Sir Kingsley Wood, Postmaster-General, on June 7 last. Lord Leverhulme, President of the London Chamber, introducing the deputation—which, he said, represented the whole of British industry and commerce—congratulated the Postmaster-General on his statement in the House that the Post Office would yield a surplus of about £12,396,000 in this financial year. As business men, they felt strongly that the time had come when the air mail should no longer be looked upon as something abnormal. On a previous occasion, when approaching the Post Office with regard to improvements in the air mail services, the London Chamber had been referred to the Air Ministry, but the deputation felt that they were right in coming to the Postmaster-General as the provision of efficient mail services was, in their view, the function of the Post Office.

Sir Geoffrey Clarke, Chairman of the Council of the London Chamber, who put the case of the deputation, referred to the fact that when the London Chamber's deputation had been received by the Secretary of State for Air in September, 1933, they had drawn attention to the very small percentage of the first-class mail carried by air, and to the fact that the air mail did not adequately meet the requirements of the business community, which expected the fastest possible transit for its mail that modern developments could offer. The British Post Office, he said, had always been to the front in the matter of improving the mail services.

He felt some diffidence in mentioning exact figures but, under the present arrangements, about five days were occupied in the conveyance of mail by air between London and Karachi and between London and Nairobi, a distance of approximately 5,000 miles in each case. In its representations to the Secretary of State for Air the London Chamber had submitted that the mail should travel at least 2,500 miles per day. This would mean that both

Karachi and Nairobi could be reached in two days. Whilst there had been some improvements both on the Indian and African air routes, it was urged that there should be a definite increase in the speed of the services.

They held the view that the first-class Empire mail should be sent by air at as low a flat rate of postage as possible—the present high charges being more in the category of telegraph rates than postal rates. Referring to the view expressed by the London Chamber in August, 1932, that air services should be utilised by the Post Office for the carriage of all first-class mail matter in the ordinary course of business at the ordinary rate of postage, he said they recognised that this was an ideal, and that some time must elapse before agreement could be reached on the question of the abolition of the air mail surcharge amongst the various signatories to the Universal Postal Convention. In the meantime, however, he urged that the Postmaster-General should use his influence with the Postal Authorities in the Dominions and Colonies with a view to the first-class mail being dispatched by air within the Empire at as low a flat rate as possible. Indeed, the principle had apparently been recognised by the Post Office in that no extra charge was being made for the conveyance of mail on the recently inaugurated air service between Inverness and the Orkneys.

While the principle of a special air mail fee had been recognised at the recent Postal Congress at Cairo, for the time being it would hardly be in conformity with international regulations for all first-class mail to be sent by air at existing rates of postage. However, in the Convention, under Article 4 (5) of the General Provisions for the Conveyance of Mails by Air, "Administrations had the option of not collecting any special fee for conveyance by air, provided that notice was given to the country of destination and by agreement beforehand with countries of transit." It seemed clear that, under this article, a flat rate for Empire air mails would be permissible.

The deputation suggested that the rates might be fixed at the foreign postage rates—2½d. for the first ounce and 1½d. for each subsequent ounce—but it was difficult to say

whether this figure would be suitable. It seemed clear, however, that the Post Office would have to retain the present Empire postage rate of 1½d. for the first ounce and 1d. for each subsequent ounce, otherwise there would be an outcry from that body of correspondents who were not so much concerned with the saving of transit time in their correspondence as with the cost of it. Until, therefore, all first-class mail could be carried by air at existing surface rates, the best policy might be to give the option of sending letters by the surface route at the existing Empire rate instead of by air at a higher flat rate.

The joint deputation again urged that it was the function of the Post Office to provide for the dispatch of the business mail by the quickest possible form of transport, and that the cost, therefore, of such services should be borne by the Post Office.

In his reply the Postmaster-General said that he was very glad to receive the deputation and grateful for all the assistance which the Chambers and the Federation had given to him. So far as the specific points dealt with by the deputation were concerned, the reply would of necessity have to be of a general character. The subjects raised were most important both from the point of view of this country and of the Empire as a whole, and he was fully in sympathy with the motives underlying the ideas put forward.

Although it was not the function of the Post Office to establish air services, it was the settled policy to use any established air service which offered sufficient regularity

and acceleration as compared with the surface routes. The whole question of the air services was at present being examined by the Departments concerned, and due note would be taken of all that the deputation had said to him. They would appreciate that such examination raised questions of much complexity, and that it would take some time before any conclusion was reached.

It had been suggested that the duty of subsidising air services should be transferred from the Air Ministry to the Post Office; but the Postmaster-General pointed out that, although the Post Office had a surplus of 13 million pounds, under the Finance Act of last year 10½ millions of that sum had to be handed over to the Exchequer, and certainly this large contribution was most valuable in reducing taxation and thus helping trade and industry. Many people would like to see a larger amount available for the Post Office, but it must be clear that money taken away from the Exchequer must be found in some other way by the general taxpayer. Many people were urging such things as a return to 1d. postage, reductions in the charges for telegrams and in many other directions.

The position was that for the carriage of air mails the Post Office paid the charges due for the services rendered by the air companies, and the view would certainly be taken in many quarters that it would be unwise for his Department to pay anything in the nature of a hidden subsidy. At present the appropriate subsidy was paid by the Air Ministry, and Parliament and the public knew exactly what was being paid.

## AIR TRANSPORT IN SWEDEN

### "A.B.A." Celebrates Ten Years' Operation

ON June 2, 1924, an aeroplane belonging to the Swedish company A.B. Aérotransport made the first flight on the Stockholm-Helsingfors route.

This proved to be the beginning of a regular air route which was to achieve solid success. Difficulties there were, and obstacles had to be overcome, but Capt. Carl Florman and those associated with him in the undertaking never lost faith, and to-day their courage and tenacity have placed the Swedish Air Lines well in the forefront of well-managed operating companies in Europe. Careful maintenance has always been the watchword of this line, and one result has been an absence of accidents which has been reflected in the confidence represented by steadily-growing traffic. On June 2 this year the company celebrated its first ten years of operation in Stockholm, where a number of Swedish and foreign air representatives were present to express their admiration for the good work done by the company. It is somewhat sad to reflect that a check in the work is threatened in the form of talk of stopping the Government subsidy. Swedish steamship lines are said to be behind this threat, as the rapid air services operated by A.B. Aérotransport have proved very serious competitors in the bid for traffic. The withdrawal

of the subsidy, if it does take place, will be an obstacle, but like others that have been overcome, we feel that Capt. Florman will surmount this one.

A.B. Aérotransport has published a very interesting booklet on its activities during the past ten years, in which many interesting events are recalled. We have not the space to deal with these in detail, but it may be pointed out that the opening of the Stockholm-Helsingfors route on June 2, 1924, was followed by the inauguration of the Malmö-Hamburg route on July 1. In Stockholm the "aerodrome" was the sheltered harbour at Lindarängen, used as a seaplane base, and the scene of the Stockholm Aero Show in 1932. In Malmö a very good aerodrome was established at Bulltofta. On May 15, 1925, the Malmö-Hamburg route was extended to Amsterdam. In 1928 experimental night flights between Stockholm and London were made during the months of June, August and September. The company uses Fokker and Junkers machines, and recently a Northrop "Delta" has been added to the fleet.

We congratulate A.B. Aérotransport on its first ten years, and express the hope that the next ten will be as successful and creditable.

## ANOTHER FEEDER-LINE MACHINE



Built specially for the "feeder-line" services of K.L.M., the Koolhoven F.K.48 monoplane shown here may be fitted with two "Gipsy Major" or "Hermes IV" engines. Four different cabin layouts are available: for "feeder-line" work, air taxi service, joyriding, or for the carriage of freight or mail. In its "feeder-line" form, the machine carries pilot, wireless operator, six passengers and luggage at a cruising speed of 118 m.p.h. For an aircraft of only 260 h.p. this is a very creditable performance.



# The AIRCRAFT ENGINEER

"FLIGHT"  
ENGINEERING SECTION

Edited by C. M. POULSEN

No. 101 (Volume IX)  
No. 6 9th Year

June 21, 1934

## CONTENTS

	Page
Atomic Hydrogen Welding .. .. .	41
The Effect of Swirl on Petrol Engine Combustion .. .. .	43
The Polar Diagram .. .. .	44
Technical Literature—	
In the Drawing Office .. .. .	48

## ATOMIC HYDROGEN WELDING

By C. R. DEGLON, B.Sc.\*

THE atomic hydrogen process of welding is probably one which is not very well known in that it is a comparatively new addition to the many processes already available to the welding side of the Engineering Industry. In view of this fact it is proposed to outline briefly the history of the process and to give a description of the principles involved.

The origin of the atomic hydrogen process is due to Langmuir, whose early experimental work showed that when tungsten was heated in molecular hydrogen the heat loss was roughly proportional to the square of the absolute temperature. This was found to apply for comparatively low temperature only, and the heat loss increased at higher temperatures until it was proportional to the fifth power when temperatures approaching 3,000 deg. C. were reached. The reason for the sudden increase in the heat loss from the tungsten was found to be due to the dissociation of molecular hydrogen into its atomic state. In order to perform this dissocia-

\* Mr. Deglon is on the Technical Staff of Metropolitan-Vickers Electrical Co., Ltd., of Trafford Park, Manchester.

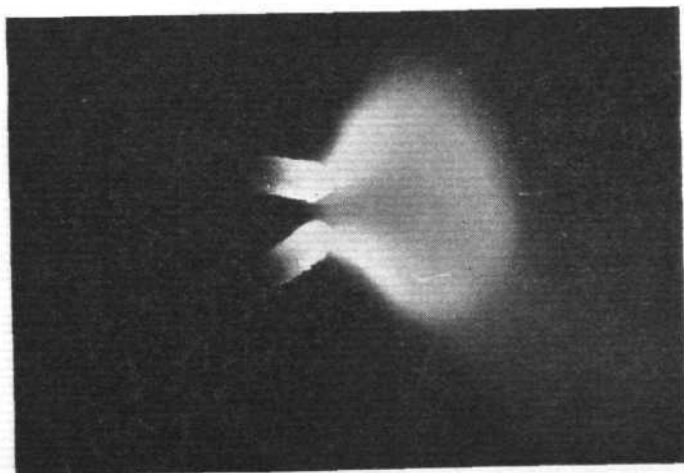


Fig. 1.



Fig. 2.

tion, a considerable amount of energy is required, and the most convenient way of obtaining this energy is by means of the electric arc.



Fig. 3.

## THE AIRCRAFT ENGINEER

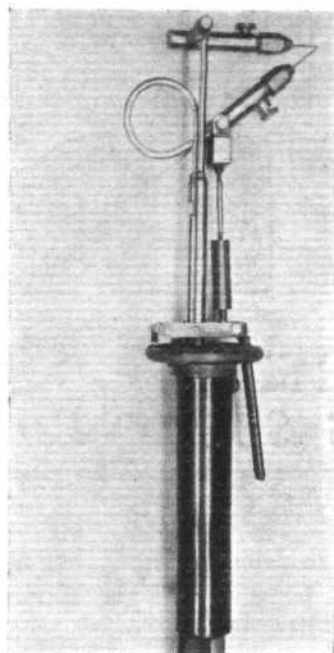


Fig. 4.

Atomic hydrogen welding consists in maintaining a continuous independent A.C. arc between two tungsten electrodes, around which is blown a stream of hydrogen. Due to the catalytic action of the tungsten the energy of the arc changes the hydrogen from its molecular to its atomic state. The atomic hydrogen rapidly diffuses from the region of the arc and recombines some little distance from it into the molecular hydrogen again. These conditions can be seen in Fig. 1, which shows the atomic flame. In changing from the atomic to the molecular state the energy originally supplied is given up in the form of heat. This atomic flame is surrounded by ordinary hydrogen burning in the usual way, and thus welding takes place in a hot flame of a single gas, which means that the weld will be taking place in an actively reducing atmosphere which is free from the contamination of atmospheric nitrogen and oxygen, the adverse effects of which are well known.

The constituents of the material being welded are not, however, immune from attack because the hydrogen

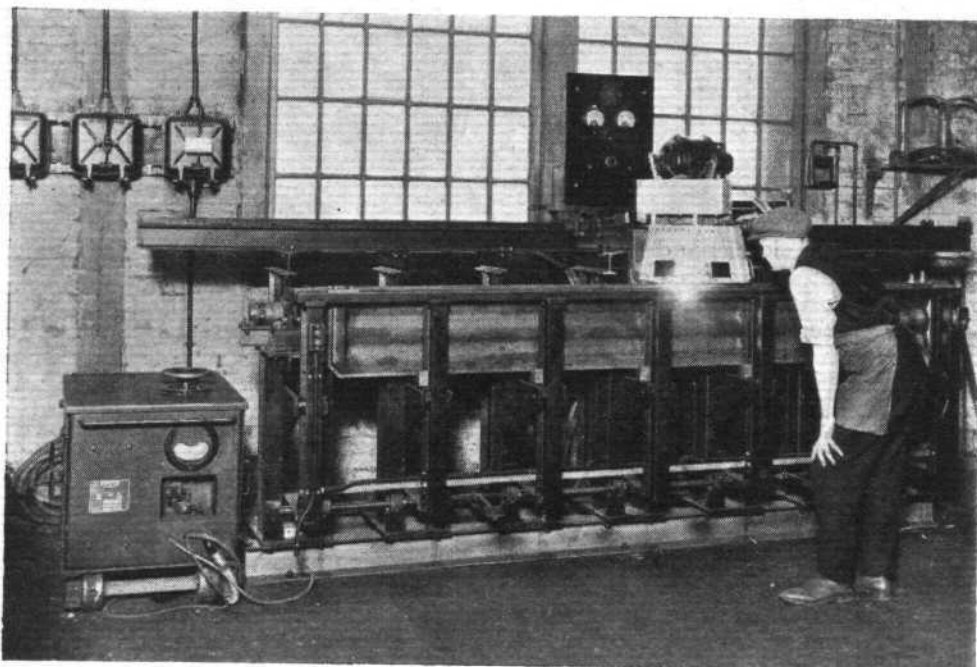


Fig. 5.

has a great affinity for carbon, and consequently there is always a reduction in the carbon content of the material being welded. This loss of carbon can, of course, always be made good by utilising a filler wire containing about 50 per cent. more carbon than the material being welded. By this means the deposit will be of approximately the same analysis as the parent metal, because no other constituents of the steel are attacked.

Welding by the atomic hydrogen process (see Fig. 2) is similar to most flame welding processes, with the exception that the metal is considerably more fluid and the atomic flame is not so rigid as other flame methods. To the inexperienced this may at first present difficulties due to the operator not being able to control the metal, but proficiency can easily be obtained with a little practice.

In Fig. 3 is shown a 35-ampere atomic hydrogen welding set, whilst the welding torch itself can be seen in Fig. 4. With a set of this type it is possible to

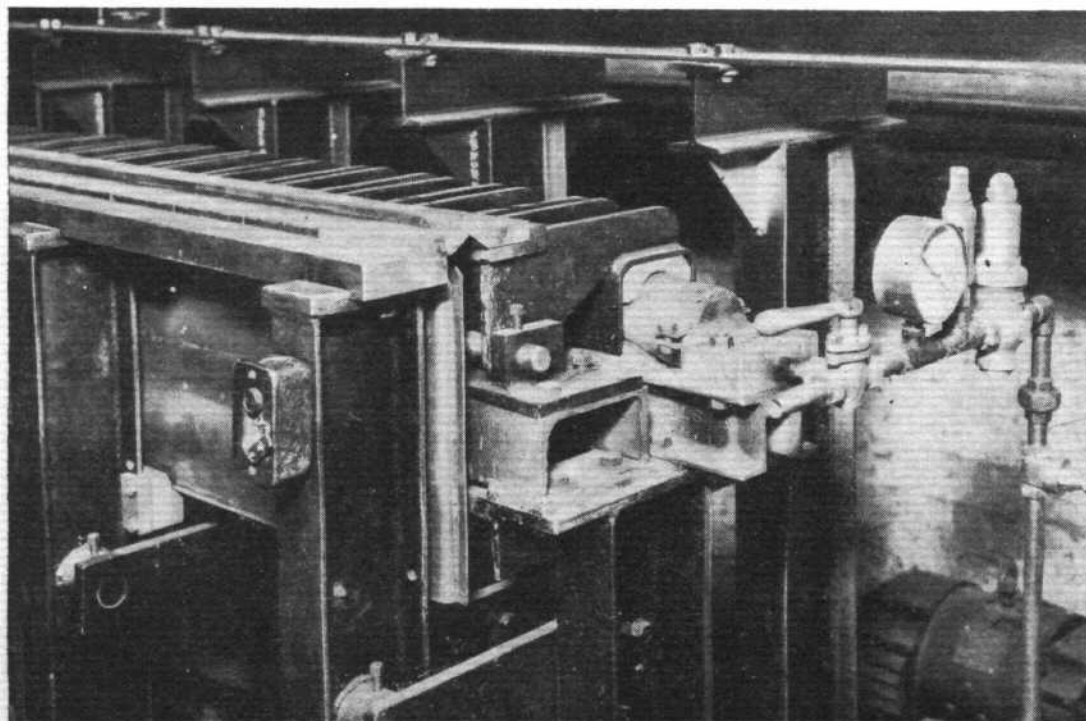


Fig. 6.



## THE AIRCRAFT ENGINEER

weld most of the non-ferrous metals and alloys, and exceptionally good results can be obtained when welding rustless steels. The advantage of the process will be readily appreciated when it is pointed out that the deposit is of precisely the same composition as the parent metal, so that no deterioration of the stainless properties will be apparent at the weld.

The extreme ductility of the metal deposited by the atomic hydrogen process renders it eminently suitable for all types of welding, and the fusion of thin material is no exception. All classes of joints can be made, but perhaps the easiest method of welding very thin plate is to use the edge weld. By this means a considerable amount of the inevitable distortion which is produced in thin plates can be eliminated, and the finished product will have a very pleasing appearance. The atomic hydrogen process has not only been developed for hand welding, but is also suitable for automatic operation.

Fig. 5 shows a completely automatic atomic hydrogen welding machine utilised for fabricating transformer radiators. This machine is used for edge-welding two pieces of .031 steel strip together. The clamping mechanism can be seen in Fig. 6, and in this connection it should be noted that in the welding of low carbon steels it is essential to keep the material hot sufficiently long to allow the dissolved hydrogen to get away, otherwise blow-holes will be formed, and that is why the clamping jaws are placed some little distance from the seam. If they are too near, chilling—with consequent blow-holes—results. In the welding of high carbon steels this effect is not so apparent because the hydrogen is attacked by the carbon in the steel, and is thus not absorbed to the same extent.

THE EFFECT OF SWIRL ON PETROL  
ENGINE COMBUSTION

BY J. F. ALCOCK

(Concluded from p. 31)

*Series E. Maximum Cylinder Pressure and Rate of Combustion Pressure Rise (Fig. 12).*—The maximum pressure is highest at a swirl of about 1.3, but the highest and lowest figures are only about 50 lb. per sq. in. apart, which is not a serious matter. The pressure is slightly higher with the offset plug.

With the central plug the rate of pressure rise varies considerably with the swirl, being greatest at a swirl rate of about 1.0, but with the offset plug it remains practically constant over the swirl range. It was observed, however, that the variations in smoothness of running did not correspond with those of the pressure rise, a better indication being the width of the rising-pressure band on the diaphragm, a wide "fuzzy" band corresponding to rough running. The following table illustrates this point:—

State	Swirl N/n	Diagram (see Fig. 13)	Rate P.R. lb./in. <sup>2</sup> × degr.	Width of rising band × degr. crank angle	Engine running
4	0	A	40	11.2	Very rough
1	0.85	B	47	6.1	Moderately rough
3	3.35	C	40	7.2	"
5	5.6	D	36	4	Smooth (but irregular)

All with central plug. The above diagrams are given in Fig. 13.

Thus, in State 4, the running is much rougher than in State 1, although the pressure rise rate is lower. The band widths, however, agree well with the changes in engine behaviour, and this suggests that the roughness is due to inequality between successive cycles, though the fact that the dynamometer readings were steady shows that the variations must average out over quite short periods. The audible roughness was observed to be uneven, in contrast to the regular "thudding" heard with an over-turbulent side valve head (which usually gives a narrow rising-pressure band).

More difficult to account for is the combination, in the high-swirl condition, of a very regular diagram, which presumably means a constant I.M.P. with the observed irregularity of torque. It is possible that the high heat flow in this condition caused a slight "drying-up" with consequent variations in friction (which would not, of course, be revealed by a motoring test).

## Swirl Control

The moral of these experiments is that in a petrol engine the swirl ratio should not exceed a value of about 3, but that, if it is below this figure, the exact value does not matter much. Since the permissible range of swirl ratio is so wide, an accurate quantitative basis for design is unnecessary, and it will be sufficient to discuss qualitatively the factors on which the swirl ratio depends.

## Engine Size and Speed

Dimensional reasoning shows that, if the effects of air viscosity and elasticity are ignored, engines of exactly similar proportions will have the same swirl ratio, whatever their size or speed. This exact similarity, however, cannot apply except in engines designed to run at the same piston speed, for of two engines, one designed for high piston speed and the other for low, the high-speed unit must have the larger inlet ports, and thus, at any given speed, the inlet velocity, and the swirl produced thereby, will be less. For otherwise similar engines designed to give the same inlet gas velocity at their working speeds, the swirl ratio will, roughly, be inversely proportional to the piston speed.

For the experimental engine above described the torque curve peaks at 1,300 r.p.m., the corresponding piston speed being 1,520 ft. per min., and the inlet gas velocity 162 ft./sec. At this speed the swirl ratio in the "neutral" condition (State 3), that is, without any pro-swirl or anti-swirl arrangements, is 3.3, a figure which is slightly beyond the desirable limit. Thus one may say that for engines designed to give their peak torque at piston speeds below 1,500 ft. per min., anti-swirl precautions will probably be necessary, and they are generally desirable where the peak-torque piston speed is less than 2,000 ft. per min. to give a margin of safety to cover errors in design or manufacture.

Viscosity and elasticity effects are very complicated, as can be seen by the variations of swirl ratio with speed shown in Fig. 7, but generally the swirl ratio, if high enough to matter, is near its maximum at the peak-torque speed, and for the present purpose one can, therefore, neglect these secondary effects.

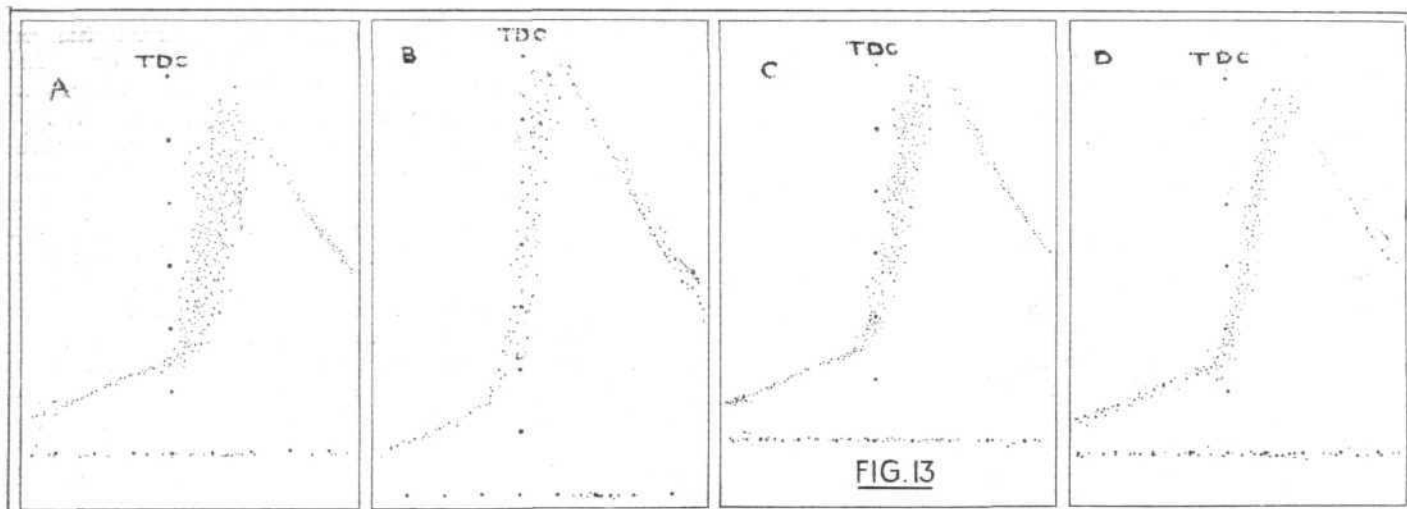
## Bore-Stroke Ratio

For a given inlet velocity the swirl is roughly in inverse ratio to the bore, and a short-stroke engine will therefore have a lower swirl than the long-stroke type. The effect is, however, small within the limits of stroke-bore ratio which are practicable for aero engines.

## Combustion-Chamber Diameter

When a rotating mass of gas is reduced in diameter, its rotational velocity is increased. Theoretically, the swirl should vary inversely as the square of the radius

# THE AIRCRAFT ENGINEER



State 4,  $N/n = 0$ .

State 1,  $N/n = 0.85$ .

State 3,  $N/n = 3.35$ .

State 5,  $N/n = 5.6$ .

**SWIRL INVESTIGATION:** Full-throttle Indicator Diagrams with different Swirl Rates. Speed 1300 rpm. Large dots give T.D.C. and atmospheric lines. The vertical spacing is one dot per 100 lb/in<sup>2</sup>, the horizontal spacing one dot per 10 deg. crank.

of gyration of the combustion chamber cross-section, since the moment of momentum is constant, but in practice the variation is somewhat less than this owing to friction and other factors.

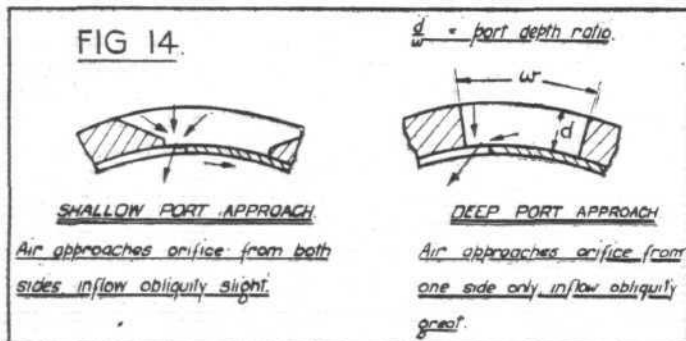
It is desirable, therefore, for the combustion chamber to be the full diameter of the cylinder and spherical. And conical sections and others of small gyration radius should be avoided.

## Inlet Port Timing

A late inlet opening increases the swirl, since the inflow velocity is increased during the early part of the suction stroke, when the obliquity of inflow is greatest. The inlet ports, therefore, should open as early as possible.

## Inlet Port Depth

As explained above, the swirl is produced by the one-sided fairing of the inlet opening by the cylinder port wall. The deeper the port, therefore, the greater the swirl, as shown in Fig. 14, and it follows that the inlet ports should be made as shallow as possible. This



Effect of Inlet Port Depth on Swirl Production.

is particularly difficult to ensure in multi-cylinder blocks, owing to the possibility of core displacements, and in such cases, therefore, anti-swirl precautions should always be taken.

## Shape of Induction Passage

As shown in Fig. 14, a considerable degree of swirl control can be effected by varying the direction of flow in the induction belt. Where possible the flow in the belt should be given an anti-swirl bias by suitably locating the inlet to the belt. In multi-cylinder blocks, however, this is often difficult for mechanical reasons, particularly where the induction belt is common to several cylinders, and in such cases one can with advantage use short baffles near one or more inlet ports in each cylinder, giving the air an anti-swirl bias. In such

cases "blowing" tests on a model form useful, if rough, guides to design.

## Swirl in Poppet Valve Engines

There is no inherent swirl tendency in poppet-valve engines, but a certain amount is produced in overhead-valve engines with inlet bends directed tangentially to the cylinder axis. This is usually too slight to do any harm, but in a few cases excessive swirl has been traced to this cause. The remedy is obviously to modify the inlet porting so as to give a more nearly radial flow.

## Summary

- (1) Excessive swirl rarely occurs in poppet-valve engines, but is liable to do so in single-sleeve valve engines, especially low-speed engines.
- (2) The swirl ratio should not exceed a value of about 3, but, if below this, its exact value matters little.
- (3) The symptoms of "over-swirl" are loss of power and thermal efficiency, low-pitched detonation noise, small ignition advance requirement and smooth running. The combination of the last two features distinguishes over-swirl from over-turbulence, in which quick ignition is combined with rough running.
- (4) Factors tending to increase swirl and therefore to be avoided, are:—Pro-swirl induction-belt flow, small diameter of combustion chamber, late inlet opening, deep inlet ports.
- (5) If avoidance of the above pro-swirl factors still leaves the swirl too high, the remedy is anti-swirl induction-belt flow or anti-swirl baffles.

## Conclusion

The writer would like to thank the Air Ministry, on whose behalf these experiments were made, and Ricardo & Co. Engineers (1927), Ltd., at whose experimental works they were carried out, for permission to publish the information given herein.

## THE POLAR DIAGRAM

### THE ELEMENTS OF A METHOD OF STRESSING BEAMS UNDER COMPRESSIVE END LOAD.

By EDGAR H. ATKIN.\*

AMONG the methods devised for calculating the strength of beams under compressive end load, one of the most elegant, and certainly one of the simplest, is the method of the polar diagram. This method was first described by its discoverer, Mr. Howard, in the Aeronautical Research Committee's Report and Memorandum No. 1233. As there expounded, however, the presentation is more suitable for the mathematician than for the practical engineer, hence there is a

\* Mr. Atkin is on the Technical Staff of Boulton & Paul, Ltd.



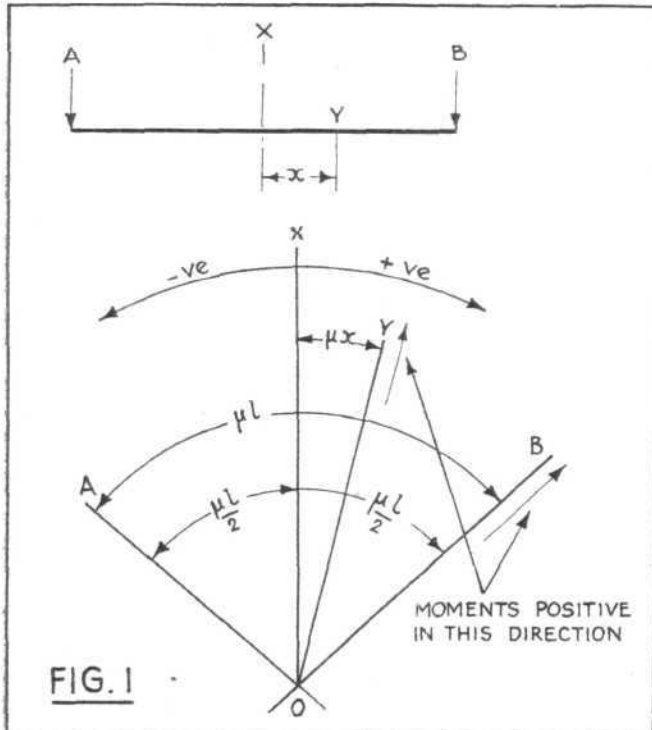
## THE AIRCRAFT ENGINEER

need for a more practical account of the method. This paper is intended to be such an outline. Although the chief applications of the method are to be found in the design of Aircraft Structures, a sufficient number of cases arise in general engineering to make it worthy of study by others who are not aeronautical men.

The great advantage of the polar diagram is that it replaces complex and laborious mathematical analysis by simple graphical constructions. During research on beams under combined lateral and compressive end load, it was recognised that if the bending moment diagrams previously plotted on a straight base were plotted as polar diagrams about a pole, great simplifications in the nature of the curves involved would result. The complicated functions of sines and cosines represented graphically on a straight base by sinuous curves could be represented in a polar diagram by arcs of circles amenable to elementary geometrical methods.

In the first place, we must show how to define a point on a beam by an angle. This is done quite simply as follows:—

Take some arbitrary point on the beam, the midpoint for example, and assume some constant  $\mu$ . To start with,  $\mu$  will be assumed to be the same for every point on the beam. Then, if  $x$  is the distance from the assumed point to any other point which has to be specified,  $\mu x$  is the angle to this point, and if  $2a$  is the length of the beam the angle  $2\mu a$  represents the length  $2a$ . Fig. 1 explains this.



Sign Convention.

Take any line OX with O as pole. This represents the arbitrary origin (e.g., mid-point of beam). To each side of OX draw the angles AOX and BOX. OA and OB represent the ends A and B of the beam, and any other radius vector OY at an angle  $\mu x$  with OX, represents the point Y distant  $x$  from X on the beam.

Distances and angles to the right of OX are considered positive; those to the left negative.

The following notation will be used:—

- $2a$  = length of beam.
- $I$  = moment of inertia of beam.
- $P$  = compressive end load.
- $w$  = distributed load per unit run.
- $W$  = concentrated load.
- $E$  = Young's Modulus.

$$\mu = \sqrt{\frac{P}{EI}}$$

$$\alpha = \mu a \text{ (called angle of beam).}$$

$$M_A, M_B = \text{end moments.}$$

In the case of single bays where  $I$  is constant throughout the bay  $\alpha$  must always be less than  $\frac{\pi}{2}$  (or  $90^\circ$ ).

We can proceed now to the various cases.

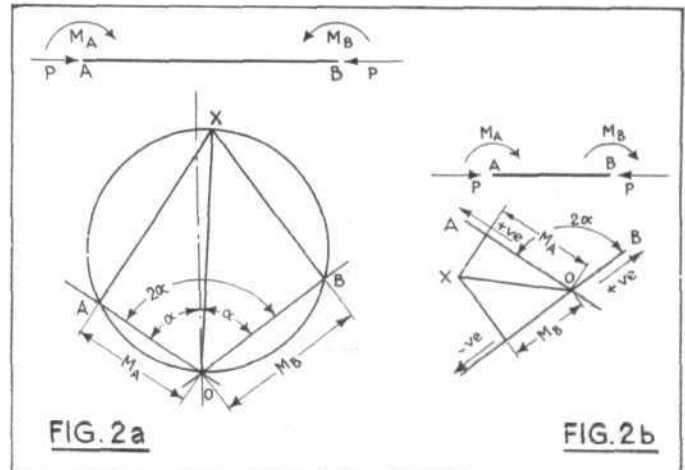
## CASE I.

Beam with end moments  $M_A, M_B$  and end load  $P$ ; no lateral load.

First calculate  $\mu$  and  $\alpha$ .

Set out the angle AOB equal to  $2\alpha$ . (See Fig. 2a).

Along OA and OB measure off to some scale  $M_A$  and  $M_B$  respectively. The sign convention for moments is indicated in Fig. 1. In Fig. 2a, both moments are assumed positive. Through A and B draw perpendiculars to OA and OB respectively to meet in Y. Join OY. On OY as diameter draw the circle OAYB.



Polar Diagram for Beam subjected to End Load and End Moments only.

The point Y at the end of the diameter OY will be referred to as the vertex of the circle. The bisector OX of the angle AOB may be inserted to represent the mid-point of the beam. From this line, angles can be measured to any other point on the spar. The radius vector at any given angle to OX drawn from O to the circle OAYB equals, to the scale of the diagram, the bending moment at the corresponding point of the beam. Fig. 2b shows the form of the diagram when  $M_A$  is positive and  $M_B$  negative.

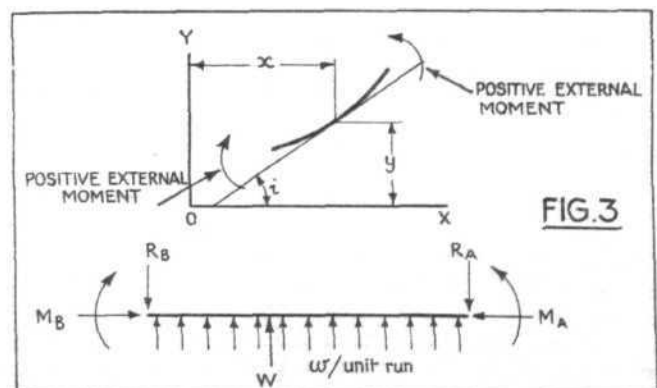
## CASE II.

Beam, with or without end moments  $M_A$  and  $M_B$ , with end load  $P$ , and uniform distributed load  $w$ . This case must be introduced by a more complete sign convention than was required for Case I.

*Sign Convention.*—Distance  $x$  along beam positive to the right.

Deflection  $y$  of any point on beam positive upwards.

Slope  $i$  of beam positive if upwards to the right.



Sign Convention.

# THE AIRCRAFT ENGINEER

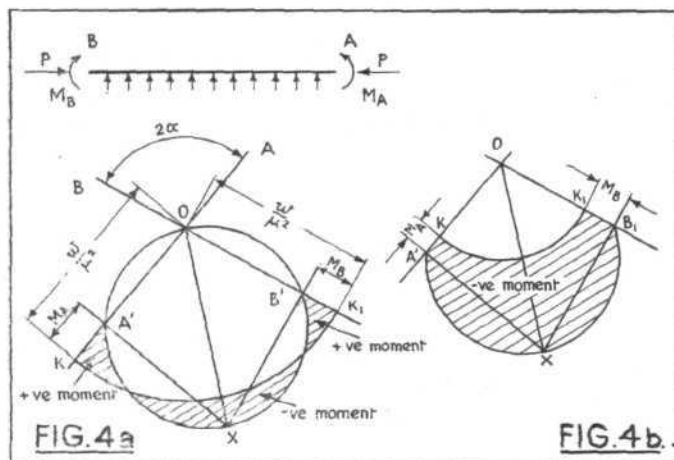
External Moment  $M$  positive when tending to bend beam concave upwards.

Distributed load  $w$  positive if directed upwards.

Concentrated Loads  $W$  positive when directed upwards.

But note that  $\frac{w}{\mu^2}$  is negative when  $w$  is positive, and positive when  $w$  is negative. Fig. 3 shows the system of signs diagrammatically. We may now continue with our problem. Assume that  $M_A$ ,  $M_B$  and  $w$  are positive. First calculate  $\mu$ ,  $\alpha$ , and the quantity  $\frac{w}{\mu^2}$ .

Let out the angle  $AOB$  as before, and with  $O$  as centre strike an arc of radius  $\frac{w}{\mu^2}$ ; as this quantity is negative, the



Beam with End Moments, Distributed Lateral Load and End Load.

arc will lie in the angle equal but opposite to  $AOB$  (see Fig. 4). The arc  $KK_1$  will be the base line from which to measure the bending moments.  $M_A$  and  $M_B$  are positive, therefore we set off  $KA_1$  and  $KB_1$  along  $OA$  and  $OB$  equal to  $M_A$  and  $M_B$  in the positive direction from  $K$  and  $K_1$ . This is shown clearly in Fig. 4. Through  $A_1$  and  $B_1$  draw perpendiculars to  $OA$  and  $OB$  meeting in  $X$ . On  $OX$  as diameter describe the circle  $OA_1XB_1$ ; the shaded area is then the bending moment diagram.

Fig. 4b shows the same diagram drawn for negative moments. In this case the bending moment is everywhere negative.

## Example (1).

A steel beam 90 in. long, moment of inertia  $0.3313 \text{ in.}^4$ , is subjected to a compressive end load of 7,500 lb. and positive bending moments of 5,500 lb.-in. and 6,730 lb.-in. at each end. In addition, there is positive lateral load of 8.5 lb.-in. run. Determine the maximum bending moment.

The loading system is as sketched in Fig. 5.

$$\begin{aligned}\mu^2 &= \frac{P}{EI} = \frac{7,500}{0.3313 \times 3 \times 10^7} \\ &= 0.000756 \text{ in.}^{-2} \\ \therefore \mu &= 0.0275 \text{ in.}^{-1} \\ 2\alpha &= 0.0275 \times 90 \times 57.3 = 141.7^\circ \\ \frac{w}{\mu} &= \frac{8.5}{0.000756} = 11,240 \text{ lb.-in.}\end{aligned}$$

The resulting diagram is shown in Fig. 5 and should be self explanatory. Max. Bending Moment = 4,530 lb.-in. and occurs at a point corresponding to  $72.8^\circ$  from the end  $A$  on the diagram. The actual distance  $x$  is given by:—

$$\begin{aligned}x &= \frac{\alpha^\circ}{57.3 \times \mu} = \frac{72.8^\circ}{57.3 \times 0.0275} \\ &= 46.2 \text{ in. from A.}\end{aligned}$$

We proceed now to a slightly more difficult problem.

## CASE III.

Beam subjected to compressive end load, a concentrated lateral load  $W$ , and with or without end moments.

Determine  $\mu$ ,  $\alpha$ , and the quantity  $\frac{W}{\mu}$ .

Commence the diagram as before, and put in the radius vector  $OC$  corresponding to the point at which  $W$  is applied. (See Fig. 6.) Measure off the overhang moments  $M_A$  and  $M_B$  and insert the perpendiculars  $AX_1$  and  $BX_2$ .

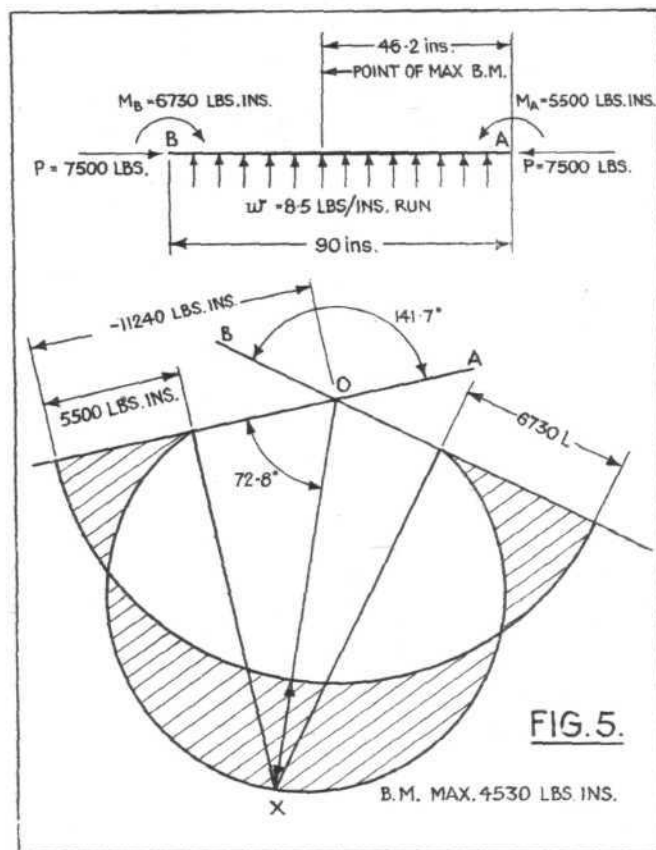


Diagram for Example No. 1.

Through any point  $D$  on  $AX_1$  draw a line perpendicular to the dividing radius vector  $OC$ .  $\frac{W}{\mu}$  being positive, measure off to the left  $DE$  equal to this quantity, and through  $E$  parallel to  $AX_1$  draw  $EX_2$  to cut  $BX_2$  in  $X_2$ . On  $OX_1$  and  $OX_2$  as diameters draw the arcs  $BF$  and  $FA$ .

The shaded area is then the polar bending moment diagram. It will be well here to introduce the reader to the method of obtaining the "true shear" at any point on the beam, and also to define positive and negative shear.

The "true shear," is defined as  $d \left( \frac{\text{true bending moment}}{dx} \right)$ ,

while the "apparent shear" is positive if the resultant external lateral load to the right of a section is downwards (upwards to the left of a section).

Take the diagram of Fig. 6, and imagine that the shear is required at  $Y$ . If then we measure  $YX_2$  to the scale of the diagram and multiply by  $\mu$  we shall have the "true shear" at  $Y$ .

If, looking along the radius vector concerned (e.g.,  $OY$ ) in the positive direction, the distance to the corresponding vertex (e.g.,  $X_2$ ) is measured to the right the shear is positive; if to the left it is negative. The direction of  $DE$  must always be decided by the sign convention for true shear. In addition it should be checked by a consideration of the general nature of the problem, from a common sense point of view. For instance, it can be seen at once in the present case whether  $W$  will increase or decrease the bending moment due to the end moments: the relative displacement of  $X_1$  and  $X_2$  must therefore be such that the bay moment is decreased when  $W$  is positive.



# THE AIRCRAFT ENGINEER

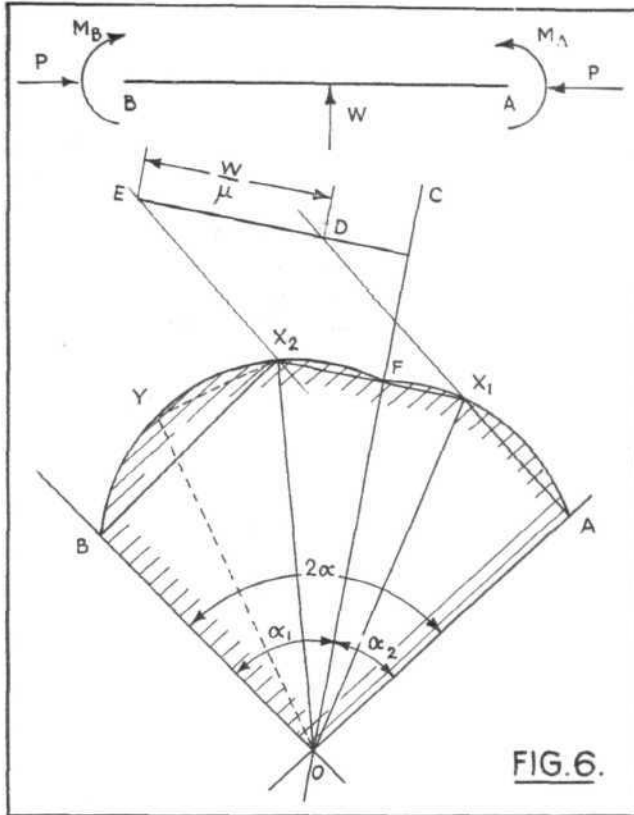


FIG. 6.

Beam with Concentrated Load, End Moments and End Loads. End Moments and Lateral Load are shown in their positive Directions.

The term "true shear" is used to distinguish it from the "apparent shear" which may be defined as the shear neglecting the end load, i.e., the shear due to the lateral loads and end moments only.

Fig. 7 shows a small part of a beam at an exaggerated inclination to its initial position. The components of the apparent shear  $S'$  and the end load  $P$  tangential to the cross section  $XX$  are  $S' \cos i$  and  $-P \sin i$ . The angle  $i$  is small, and therefore in accordance with the usual assumptions of the beam theory we may put

$$\cos i = 1 \text{ and } \sin i = i.$$

The true shear  $S$  is then given by the equation

$$S' = S + iP$$

## Example (2).

The beam of example (1) has the same end load and end moments, but instead of a distributed lateral load there is a single negative concentrated load of 40 lb. 30 in. from the end at which the moment is 5,500 lb.-in. Determine the maximum bending moment.

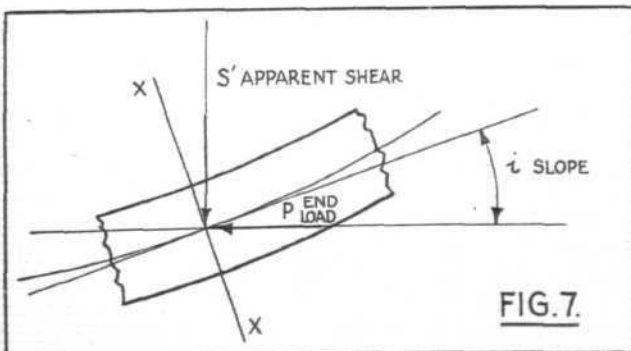


FIG. 7.

RELATION BETWEEN TRUE AND APPARENT SHEAR:  
True Shear on section  $xx = S' - iP$ , or  $S' = S + iP$ .

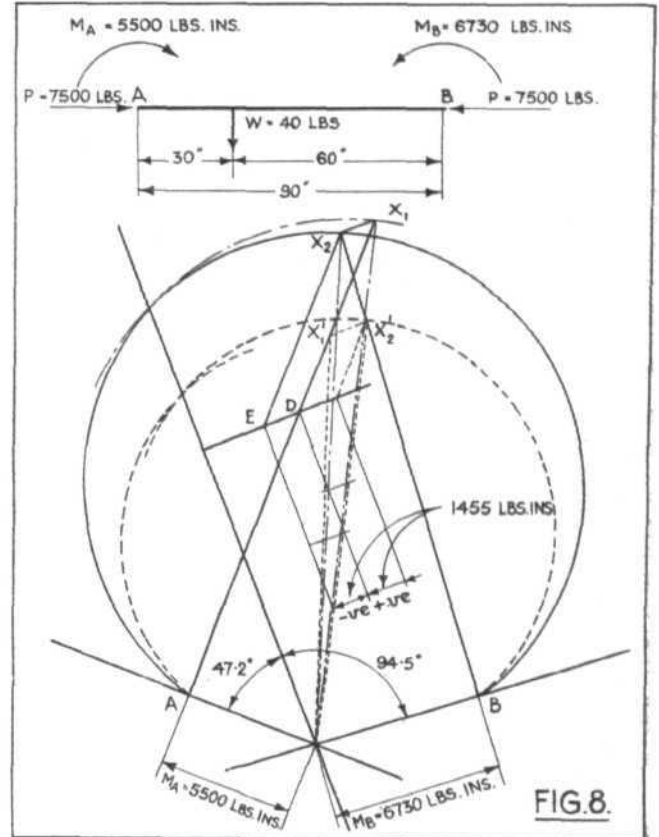


FIG. 8.

Diagram for Example No. 2.

From example No. 1

$$\mu = 0.0275 \text{ in.}^{-1}$$

$$\text{and } \therefore \frac{W}{\mu} = \frac{40}{0.0275} = 1,455 \text{ lb.-in.}$$

$$\text{also } a \text{ for whole bay} = 141.7^\circ$$

$$\therefore a \text{ for 30 in.} = \frac{1}{3} \times 141.7^\circ = 47.2^\circ$$

Having obtained the requisite data, we can now proceed with the diagram according to the construction given above. (See Fig. 8a). Set out the bounding lines OA and OB to include  $141.7^\circ$  and draw OC at  $47.2^\circ$  to OA. Measure the end moments along OA and OB and draw perpendicular to these lines through the points so obtained.

Through any point D on the perpendicular to OA draw DE, to the right (W will evidently increase the bending moments in the bay) at right angles to OC, equal to  $\frac{W}{\mu}$  and through E draw  $EX_2$  parallel to AD to meet the perpendicular  $BX_2$  to OB in  $X_2$ . Through  $X_2$  draw  $X_1X_2$  parallel to DE to meet AD in  $X_1$ . Then  $X_1$  and  $X_2$  are the vertices required, and the arcs OAZ and OBZ of the circles on  $OX_1$  and  $OX_2$  respectively as diameters complete the diagram.

It remains to draw the modified diagram for the case when the load W is in the opposite (i.e., positive) direction. The construction proceeds on exactly the same lines but DE is drawn to the left instead of to the right. This is shown in Fig. 8 by the dotted circles on the diameters  $OX_1$  and  $OX_2$ .

(To be continued.)

# THE AIRCRAFT ENGINEER

## IN THE DRAWING OFFICE MONOPLANE WING LAYOUT

By H. H. HUTCHISON.

THE ensuing method of laying out a monoplane wing is applicable particularly where it may be found necessary for reasons of expediency to vary the proportionality of the rib contours. In other words, the locus of the C.P. is made to depart from the conventional path, as in the case of a normal two-spar wing.

In the case I am dealing with two spars are shown, but, of course, the method of laying out applies equally as well for a monospar.

The wing dealt with is straight in front elevation from left-hand wing tip, along the tops of the ribs to right-hand wing tip.

Fig. 1 is an outline in plan indicating the rib spacing. If the positions of the spars are already fixed up, dimensions for the nose and trailing edge can be given from these, otherwise a datum line is necessary.

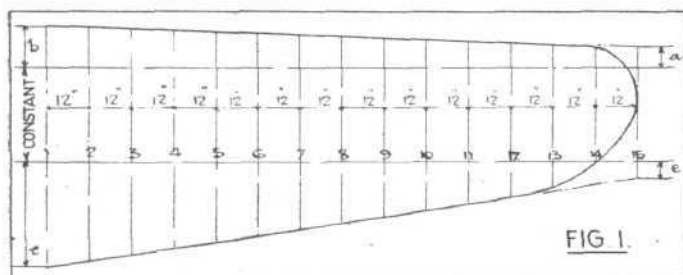


FIG. 1

The dimensions for the chord, nose to centre line of front spar and trailing edge to centre line of rear spar can be found readily from Fig. 1 by calculation, or by the following graphical method.

For simplicity sake it is assumed that the rib spacing is 12 in., and that the spar axes are parallel in plan view.

Draw a horizontal line representing the spar centre lines coincident. Draw parallel lines to represent the ribs perpendicular to this line at 1 in. apart.

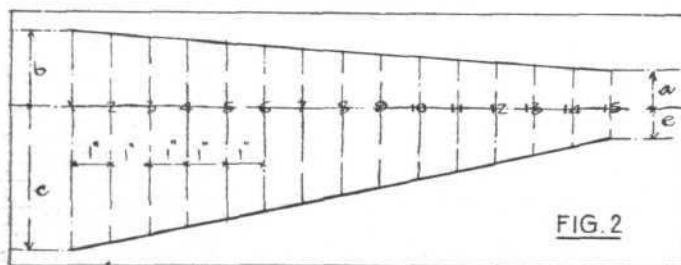


FIG. 2

At line 1 measure up, full size, dimension "b" from Fig. 1 above the horizontal line, this being the amount the nose is ahead of the front spar at rib 1. Below the horizontal line measure off dimension "c," again at line 1, i.e., the amount the trailing edge is behind the rear spar at rib 1.

Proceed in the same way at line 15, using dimension "a" above, and "e" below, Fig. 1.

By joining these points all the other rib lengths + the constant can be measured off full size, due allowance to be made at the end ribs when detailing for the wing-tip curve.

Having decided the wing section, superpose in end elevation the rib contour of the smallest rib, neglecting end ribs, on the rib contour of the largest rib, placing the chord lines at that distance apart required to give the correct dihedral, dimension "x," Figs. 3 and 4.

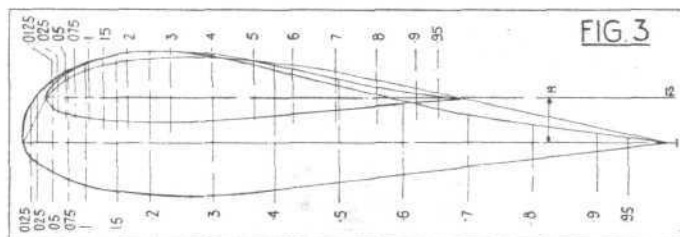


FIG. 3

Next mark off on the chord lines 0.0125, 0.025, 0.05, 0.075, 0.10, 0.15, 0.20, 0.30, 0.40, 0.50, 0.60, 0.70, 0.80, 0.90 and 0.95 of the respective chords and draw perpendicular lines, cutting the contour. Scale these vertical dimensions, enter them in a table, and prepare a series of foreshortened views—one of which is Fig. 4—in order to use the dimensions thus found.

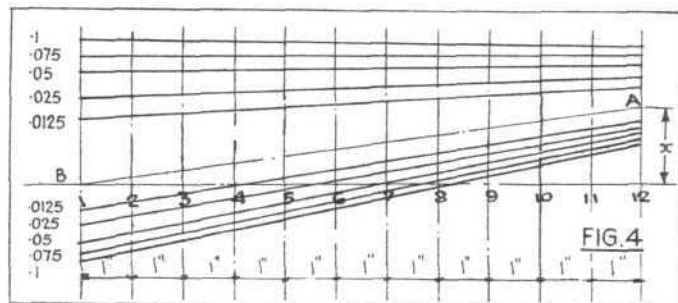


FIG. 4

Start by drawing twelve vertical lines 1 in. apart, Fig. 4, and a horizontal line across them. From the horizontal line measure up line "12" full scale the amount the small rib chord line is above the large rib chord line, dimension "x," Figs. 3 and 4. Join this point to the point of intersection of line 1 and the horizontal line. The intersections of this sloped line with the vertical lines are therefore the chord lines of all the other ribs between "1" and "12."

Above and below points "A" and "B" measure off full size the dimensions of the ordinates of the contour of ribs "1" and "12" at the various stations, i.e., 0.0125, 0.025, etc., taken from Fig. 3, and join up. Thus the ordinates of the contour of all the other ribs may be scaled off full size each from its respective chord line, i.e., the point at which the line A-B intersects the rib lines.

A similar diagram to that of Fig. 4 can be further used to lay in the axes of the spars in front elevation, for by this means the relative position of the rib chord line and spar centre line at any rib can be measured off straight away full size.

And so with the hinge centre line of the aileron. Select a rib, say 9, and fix the centre line of the inner hinge upon it. From this point draw a straight line to the extreme tip. Again the relative positions of the hinge centre line, chord line, and spar centre at each rib is obtainable to full size scale, no matter how big the wing span.

Mention of the extreme wing tip calls for a brief word upon fairing off the wing tip from rib 12 outwards.

A compromise is necessary as a rule. The chord lengths of ribs 13 and 14 are definitely fixed in Fig. 1 in order to obtain the good end curve. Thus a fair curve in end elevation, Fig. 3, allied with a reasonable curve in Fig. 4 (extended), using the rib lengths of 13 and 14 chords, correctly spaced as regards other ribs in plan, but not so in end elevation necessarily, is a practical solution of the problem.



# A NORTH DEVON AERODROME

## *Opening Ceremony and Flying Display at Barnstaple*

**B**ARNSTAPLE is lucky in having the first properly established and licensed aerodrome in North Devon. Mr. R. T. Boyd and Mr. T. Nash are primarily responsible for getting it going, and they are lucky to have got the backing they wanted from local people of importance like the Mayor of Barnstaple (Councillor C. Dart), who performed the opening ceremony on Wednesday, last week. In a few well-chosen words delivered over the loud speakers, he explained that the authorities were proud to be associated with the enterprise of Mr. Boyd, and he felt that the people of the district would, in the future, be glad that this admirably placed aerodrome had been established. Having declared the aerodrome open he, together with the Mayoress, was taken for a flight over Barnstaple, in a Desoutter, by Mr. Boyd.

The club (the Barnstaple and North Devon Aerodrome Club), has actually been functioning to a certain extent since last December, and in that short time has attracted 140 members, of whom nearly 50 are flying members, a very fine percentage indeed. They have two "Moths" for instruction, and also stationed at the aerodrome is a Desoutter which Mr. J. E. D. Scott operates for taxi and joyriding work. He finds that already a steady demand is being evinced of the need for taxi services in the district. This is not surprising when one knows that there is quite a considerable amount of business activity in the neighbourhood and that the railway journey to Cardiff takes 6 hours, whereas by air it can be reached in 40 minutes.

Westward Ho, famed for its golf course, is another place to which visitors to Barnstaple want to go, and when they try it they find they have to go round 16 miles by road. By air it is almost a case of taking off and straight away landing again, as Westward Ho is just the other side of the river from Barnstaple Aerodrome. At the present time there is a little difficulty about getting permission to land at Westward Ho, but the suitable ground belongs to the Crown, so ultimately the difficulties should be overcome.

After the opening ceremony there was an aerobatic display by one of the club's pupils, and then the assembled members and their friends—who turned out in greater



**THOSE RESPONSIBLE :** Messrs. R. Boyd (left) and T. Nash, who are those whom the populace of North Devon has to thank for founding the Barnstaple Aerodrome. (FLIGHT Photo.)

numbers than we have seen for some time—were taken up for joyrides. Among those who assisted were the Mayors of Bideford, South Molton and Torrington, and the chairmen of the Urban District Councils of Ilfracombe and Lynton. Quite a large number of people flew down for the occasion and consequently there was a good variety of aeroplanes for the members to look at. They

expressed surprise at the speed at which aeroplanes could travel about—most of them being new to the joys of flying—and saw great future possibilities in the fact that we had, thanks to the aviation representative of the National Benzole Company with his "Leopard Moth" ("Gipsy Major"), been able to make the journey from Heston in less than an hour and a-half as against the four and a-half hours minimum taken by the railway; it seems probable from this that Mr. Scott will soon find that he has more orders than he can cope with for charter work.

C. N. C.

**A DEVON AERODROME :** The Mayor of Barnstaple, Councillor C. F. Dart, declares the Barnstaple and North Devon Aerodrome open.



### THE THIRD S.B.A.C. FLYING DISPLAY

EVERY year the Society of British Aircraft Constructors organise a flying display with the co-operation of the Air Ministry. This display, which is held at Hendon Aerodrome, takes place just after the Royal Air Force Display, at the same aerodrome, and was primarily designed for the purpose of letting foreign visitors see all our latest types, commercial as well as military, at close

quarters. The first two displays proved conclusively that the scheme was an excellent one for bringing together our manufacturers and designers and the representatives of commercial and military aviation who come to England annually from almost every country in the world. It can confidently be expected that this year's display will be even more interesting than those of previous years.

# THE FOUR WINDS

ITEMS OF INTEREST FROM ALL QUARTERS

## A Bleriot Anniversary

In honour of the 25th anniversary of M. Blériot's flight across the Channel, a "comfort and elegance" competition for tourist aeroplanes will be held at the Blériot Aerodrome at Buc on Saturday, June 23.

## Lord Londonderry Flying Again

The Secretary of State for Air has suffered no ill-effects from his recent landing mishap, and was flying solo again within two days of the accident. He is keeping his hand in on Airwork School "Cadets" until his own aeroplane is repaired.

## An Exhibition in Milan

Between June and October an Exhibition of Italian Aeronautics is being held in the Palace of Arts, Milan, with aerial "manifestations," meetings, and entertainments. Visitors from abroad will be encouraged by fare reductions on air lines and on railways.

## Wireless Masts Again

Near Watchet, on the North Devon coast, there are two tall wireless masts. They are right in the line of flight between London (Heston) and Barnstaple, and due to their dull colour extremely hard to see. Surely it would not cost the authorities responsible a very great deal to paint a few sections of the length of these masts some distinctive colour, say white or yellow? A comparatively small matter, but vitally important.

## Smugglers Caught by Seaplane

One of the Finnish Naval Guard seaplanes, after a violent contest on the open sea, has succeeded recently in capturing a smuggling motor-boat and arresting the crew of three men. The capture was effected with great risk, as the smugglers endeavoured to ram and sink the machine when it had alighted on the water. Not even the gun-fire of the machine induced the smugglers to assume a reasonable attitude, but finally the boat was shattered and the three men, well-known smugglers, were arrested and conveyed to Helsingfors.



LIFE IN THE OLD DOG YET: Hans Grade flying his 25-year-old Grade monoplane during the "Flying Day" celebrations in Berlin.

## Twenty-five Years Ago

From FLIGHT of June 19, 1909.

"M. Blériot has once again placed a milestone on the rapidly-growing road of aeronautical progress by being the first to achieve free flight on a heavier-than-air machine with two passengers beside himself on board."

## British Successes Abroad

At the Panslav Aeronautical Meeting at Brno, Czechoslovakia, held on June 10 last, Capt. Ivan Mrak (Aero Club Zagreb, Yugoslavia) won the race over a triangular course of 63 km. on a "Puss Moth" ("Gipsy III") in 18 min. 28 sec., and M. Adamovitch (Aero Club Belgrade) on a metal "Moth" ("Gipsy I") was second. Other competing machines were Czechoslovak and Polish makes.



FOR ENGLAND-AUSTRALIA RACE: The Blériot 111 monoplane fitted, it is believed, with a Gnome-Rhône K.14 ("Mistral") engine, entered for the MacRobertson England-Australia Race.





PER "FAITH IN AUSTRALIA": A cover carried on the first official air mail between Australia and New Zealand by C. T. P. Ulm in his Fokker *Faith in Australia*. It is "backstamped" "Wellington. 12 Ap. '34: 3 p.m."

### "The Aircraft Engineer"

The AIRCRAFT ENGINEER appears as a supplement in this issue of FLIGHT, that is, one week earlier than usual. The change is occasioned by the special R.A.F. Display Number of FLIGHT, which will be published all over the country next Thursday, June 28.

### Miss Meakin's Loops

Miss Joan Meakin executed 18 loops in her glider last Saturday at Bristol Airport, thus beating Frau Hanna Riche's bag of 15 loops. She was towed to 4,500 ft. before slipping the cable and commencing her loops.

### Wedding of Mr. C. R. Fairey

Mr. C. R. Fairey was married at Bournemouth on Monday, June 18. We feel sure that the many admirers of Fairey aircraft who must be among our readers will join us in wishing Mr. and Mrs. Fairey every happiness.

### Henlys' Rally

Henlys motor-car and aeroplane rally, which is to take place at Heston on June 23, will this year include a "concours d'elegance" for aeroplanes. Airwork, Ltd., as in other years, are offering a prize, which will go to the winner of that event. In addition to various aerial events, the massed bands of H.M. Coldstream Guards and H.M. Welsh Guards will play during the afternoon and give an exhibition of marching and counter-marching.

### Four Miles High with 5 tons

Flying a new Farman machine, the French pilot, Lucienne Coupet, accompanied by a mechanic, has attained an altitude of 23,545 ft. with a load of 5 tons.



EAST IS WEST: Joyriding is now very popular with Japanese girls. Here are two "Geishas" about to make a flight in a Junkers F.13 operated by Japan Air Transport Institution at Ohama, Sakai, near Osaka.

### Special Display Number

Next week's issue of FLIGHT will deal with the R.A.F. Display at Hendon on June 30. The issue will contain many special features and be considerably enlarged.

### Flying Carnivals in New York

Floyd Bennett Field, the New York Municipal Airport, has been leased for a series of week-end air carnivals this summer, to defray expenses for the airport and bring in revenue for necessary improvements.

### Soviet Gliding Meeting

A gliding meeting has been organised by Osoaviakhim (the Society of Friends of Defence and the Aviation and Chemical Industries), and will be held next September in Koklebel (the Crimea). Many gliders constructed in various parts of Russia will, it is stated, take part, including ornithopter gliders with flapping wings!

### Russian Glider Experiments

We have already reported the "glider-train" flights made in Russia recently, and now it is reported that the Samara Aero Club has succeeded in the experiment of an aeroplane, while in the air, lifting a glider from the ground. The glider (a Gribovsky G-9) was "hooked" by means of a special device invented by M. Popov, Vice-President of the Samara Osoaviakhim.

## Diary of Forthcoming Events

Club Secretaries and others are invited to send particulars of important fixtures for inclusion in this list:

June 23. Lancashire Ae.C. Air Display, Woodford.  
June 23. Henly Rally, Heston Airport.  
June 29. R.A.F. Twelfth Annual Dinner.  
June 30. Royal Air Force Display, Hendon.  
July 3-9. 4th International Congress for Applied Mechanics, Cambridge.  
July 7. Opening of Leicester Airport.  
July 8. French International 12-Hours Reliability Trial.  
July 8. Competition for Model Aircraft, Great West Road Aerodrome.  
July 13-14. King's Cup Race. Start and finish at Hatfield.  
July 21. Round the Isle of Wight Air Race.  
July 21-22. French Grand Prix.  
July 28. Bristol and Wessex Ae.C. Garden Party.  
July 29. London-Sherburn Race (York County Aviation Club).  
Aug. 11. London-Newcastle Race (Newcastle-on-Tyne Ae.C.).

Aug. 15. Air Tour of Italy.  
Aug. 17-Sept. 6. Copenhagen Aero Show.  
Aug. 18. Cotswold Aero Club Air Rally and Garden Party.  
Aug. 25. Liverpool and District Ae.C. Garden Party, Speke Aerodrome.  
Aug. 28-Sept. 16. International Touring Competition, Poland.  
Sep. 1-2. Cinque Ports Flying Club International Rally, Lympne.  
Oct. 6. London-Cardiff Air Race and Cardiff Ae.C. Air Pageant and Dance.  
Oct. 7. Aviation Golf Meeting, Royal Porthcawl Golf Club, Porthcawl.  
Oct. 20. England-Australia Race for MacRobertson Prize.  
Nov. 16-Dec. 2. 14th International Aviation Exhibition, Grand Palais des Champs-Elysees, Paris.

# AEROBATICS AT VINCENNES

## *International Pilots Compete for The World's Championship Acrobatic Aviation Cup*

**T**HIS Cup was competed for at a Two Days' Meeting held at the Vincennes Aerodrome in France on Saturday and Sunday, June 9 and 10. It was organised by the Aero Club of France, under the regulations of the F.A.I., and managed by the Air Propaganda Society, of which Messrs. Gano and Dravet are the moving spirits, with the support of the Paris daily newspaper, *le Petit Parisien*.

Cash prizes of 275,000 francs (£3,600 approx.) were awarded as follows:—100,000 francs to the winner, 75,000 francs to the second, 50,000 francs to the third, 25,000 francs to the fourth, 15,000 francs to the fifth, 10,000 francs to the sixth.

During the first day of the Meeting all competitors in the Acrobatic Contest were required to perform a stated list of evolutions within a time limit of eight minutes, as follows:—

A spin of 3 turns to the right and 3 turns to the left. A loop, with a half-roll off the top. A fast barrel roll to the right and to the left, each in less than 4 sec. A slow barrel roll to the right and to the left, each in more than 10 sec. A downward outside loop. A circle while flying on the back. An inverted loop, forward and upward.

On the second day of the Meeting the contestants were allowed 10 minutes each to perform a list of figures of their own choice.

Each one of these figures presented and performed counted for a number of points, which were multiplied in turn by a coefficient, calculated according to the difficulty of performing the evolution. New figures proposed to be executed by the competitors were required to be submitted in advance to the Jury, who accorded them a number of points and their co-efficients. The competitors were requested to vary their lists as much as possible and not to perform similar figures a second time. An International Jury judged the Contests.

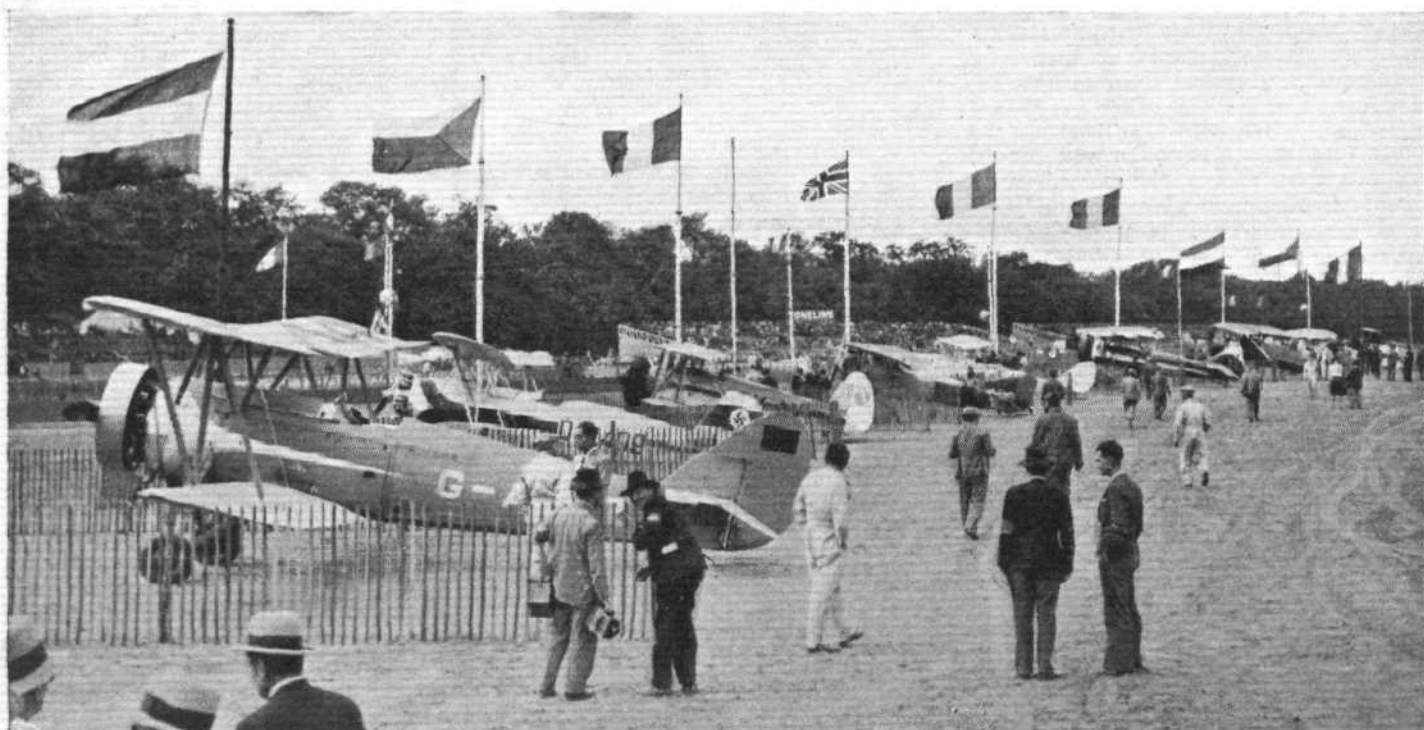
The first part of the Contest on Saturday passed off quietly.

Detroyat went through his figures with his customary dash and skill. He had changed his plane from the Morane-Saulnier monoplane, type 234 (Hispano-Suiza 300-h.p. engine), which he piloted in his recent contest with Doret, to a Morane-Saulnier Pursuit monoplane,

equipped with a Gnome & Rhone 550-h.p. engine. Fiesler piloted a biplane specially constructed by himself for acrobatic flying, and equipped with Walter "Pollux" 420-h.p. engine. He showed the same smooth continuous form that he had displayed in his appearance at Villacoublay last autumn. Clarkson also accomplished his programme with ease, but was clearly handicapped by having only a 130-h.p. motor. Colombo likewise performed brilliantly, but his figures did not appear as smooth as those done by some of the others.

On the Second Day of the Meeting Clarkson was the first to take off. He presented an attractive list of figures, some being quite original, which he executed with skill, but was again handicapped by his light engine power in comparison with some of his competitors. He was followed by Cavalli, Ambrus and Colombo, the latter in straightening out from a spin clipped a portion of some of the branches from the neighbouring trees. Capt. Abreu then followed. He had exchanged the small Junkers Jr low wing, all-metal monoplane (Siddley "Genet"), which he had piloted at the Vincennes Meeting some three weeks previously, for an Avro "Tutor" (Siddley "Lynx"). His daring and dash were much admired, and he had about finished his list of figures when he made an inverted dive, evidently intending to straighten out with a half-roll when he came close to the ground. As was his custom in performing his figures he was flying at great speed, about 200 miles per hour, when he came near the ground he was unable to control the machine and crashed. The machine immediately burst into flames, and the firemen, who were quickly on the scene, were unable to extricate the pilot before his body was badly charred. Capt. Abreu was undoubtedly killed, however, by the impact with which his machine struck the ground.

The Meeting was immediately suspended, and the Managers held a conference with the Contestants, which the Air Minister also attended. At the request of the Commandant Portales, the Portuguese Air Attaché at Paris, it was decided to continue the Match. Four pilots remained who had not as yet performed their figures, these included Detroyat, Fieseler, Achgelis and Novak. By the direction of the Air Minister, General Denain, the Jury ordered that all figures should hereafter be executed at



AN INTERNATIONAL GATHERING: A view along the machine park at Vincennes. The Avro "Tutor" of the ill-fated Portuguese competitor is in the foreground.



an altitude of not less than 200 m. (650 ft.).

The flags throughout the aerodrome were lowered to half-mast and the Portuguese National Anthem played by the band, with the crowd standing with bared heads and the soldiers at attention.

Fieseler was able to execute but 32 and Detroyat 30 of their desired evolutions within the given limit of 10 minutes. Both performed brilliantly, but the smooth, continuous style of Fieseler, who piloted his specially constructed biplane easily and quickly from one figure to another, won the day.

The final result, with the points gained, was:—Gerhard Fieseler (645.5). Michel Detroyat (622.9). Gerd Achgelis (537.6). Frant Novak (451.8). Georges Cavalli (361). Ambrogio Colombo (344.8). Placido d'Abreu (337.3). Jan Ambrus (309.2). Christopher Clarkson (144).

In addition to the Stunting Competitions, a squadron of

#### THE COMPETITORS

Name	Nationality	Plane	Engine
Captain Placido da Cunha d'Abreu	Portugal	Avro "Tutor" biplane	Siddeley Lynx 215 h.p.
Gerd Achgelis	Germany	Focke-Wulf F.W. 44 biplane	Siemens S.H. 14 170 h.p.
Jan Ambrus	Czechoslovakia	Avia B. 122/1 biplane	Walter "Castor" 260 h.p.
Georges Cavalli	France	Gourdou-Lesseure monoplane	Hispano-Suisa 300 h.p.
Christopher Clarkson	Great Britain	de H. "Tiger Moth" biplane	"Gipsy Major" 130 h.p.
Colombo Ambrogio	Italy	Breda "28" biplane	Piaggio-Stella K.7, 300 h.p.
Michel Detroyat	France	Morane-Saulnier 225 "parasol" monoplane	Gnome & Rhone K.9, 550 h.p.
Frant Novak	Czechoslovakia	Avia B. 122 biplane	Walter "Castor" 260 h.p.
Gerhard Fieseler	Germany	Fieseler "F. 2 Tiger" biplane	Walter "Pollux II" 420 h.p.

3 Morane-Saulnier, type 225, Pursuit planes from the Etampes Airport and one of seven planes from the Dijon Base gave exhibitions of group flying over the field. The Italian squadron, composed of 9 Fiat, C 30, Pursuit planes, that have been in France on a visit on their way home from the Brussels Meeting, also followed with some perfectly executed manœuvres.

R. C. W.

## AIRWORTHINESS

### International Commission for Air Navigation

LISBON Town Hall was the site of the 22nd session of the I.C.A.N. between May 29 and June 2. Gen. Silveira e Castro, Vice-President of the National Air Council, Chief of Military Air Service and Portuguese Delegate to the Commission, was elected President of the 22nd session. Twenty-three States were represented out of the 28 parties to the Convention. Great Britain and Northern Ireland being represented by Lt. Col. F. C. Shelmerdine, Director of Civil Aviation, with Maj. J. S. Buchanan, Mr. W. W. Burkett and Flt. Lt. W. A. Duncan.

Among the questions discussed and the work done during the session were:—Amendments to, and completion of, certain parts of the regulations relating to the minimum requirements for the issue of certificates of airworthiness for aircraft, particularly with regard to (a) the requirements for taking off of seaplanes and amphibians, (b) the

stability, manœuvrability and seaworthiness of the same class of machine, (c) the resistance tests and calculations of landing gears, (d) general arrangement and equipment of seaplanes and amphibians and (e) the new regulations relating to the conditions governing the validity of airworthiness certificates of damaged aircraft. With regard to this latter cause, the contracting States were invited to draw up individual agreements between themselves with a view to utilising to the greatest possible extent the rights of each State to delegate its powers of decision in the assessment of damage sustained by an aircraft of its nationality within the territory of another State.

The Commission completed the drafting of provisions relating to the new system of international maps for use in air navigation. It was decided to compile each year a specially printed edition of the Air Traffic Statistics for the previous year published in the I.C.A.N. Bulletin.

## Two Special R.A.F. Display Numbers of **FLIGHT**

### JUNE 28th—R.A.F. Display.

THIS will be a considerably enlarged issue, and among other special features will contain informative notes about the various types of service aircraft in the Display, some observations upon their special duties, the work of the various squadrons and details of their training.

Also Commercial Aviation, Airlines, Airports, Private Flying and Notes & News of the Week.

Copies of this number will be on sale in the enclosures at Hendon.

### JULY 5th—S.B.A.C. Exhibition.

#### Report of R.A.F. Display.

THE second of the "FLIGHT" special issues will contain among other features—

An illustrated review of the aircraft and equipment at the exhibition at Hendon arranged by the Society of British Aircraft Constructors.

The R.A.F. Display Report written by the staff of "FLIGHT" and illustrated with exclusive pictures by the journal's photographers

This issue will constitute a dependable and informative record of these events particularly valuable to those who are unable to visit Hendon.

Definite orders for these special numbers of "FLIGHT" should be placed with newsagents and bookstalls.

# From the Clubs

Events and Activity at the Clubs and Schools

## LANCASHIRE

Visitors arriving for the display which will take place on Saturday next are particularly asked to note that they should arrive at the aerodrome before 1 p.m., as it will be necessary to fly off the heats of the Inter-Club Relay Race between 1.30 and 2.30 p.m., before the main programme starts. During that time visiting aircraft are asked to keep away from the aerodrome. Those who have arrived by air will be free to depart between 5.30 and 6.30 p.m. if they do not wish to stay for the evening display. There is a "sealed time of arrival" competition for those arriving between 12 noon and 12.30. In the evening there will be an informal buffet dance (morning dress) and visitors intending to stay the night are requested to notify the Club Secretary so that accommodation may be booked. Picketing gear will be provided for aircraft which cannot be accommodated in the hangar.

## GUERNSEY

Guernsey Aero Club have purchased a plot of land at L'Eree on the west coast of the island of Guernsey, where draining operations have been started preparatory to making it into an aerodrome.

## AIR SERVICE TRAINING

Students from 25 different countries are under training at the Air Service Training School at Hamble, where greatly increasing activity is taking place. Those who started with the first long training course have already obtained responsible positions with airline operating companies.

## BOMBAY

Flying time for the month of May at the Juhu Aerodrome of the Bombay Flying Club was 145 hr. 45 min. This is below the usual total, but only one "Moth" was in working order. The Club closed down on June 10 for the monsoon period. During the month Mr. F. S. Mehta and Mr. N. N. Wadia completed the tests for their "A" licences and Prince Ghanshyamsinghji of Limbdi re-qualified. The offices of the Club have temporarily been moved to Cooks Building, 324, Hornby Road, Fort Bombay.

## NORTHAMPTONSHIRE

The total flying hours at Sywell Aerodrome continue to increase. During the past week Miss Faith Bennett and Mr. T. H. White have made first solo flights.

## HATFIELD

Members of the London Aeroplane Club flew 104 hr. 25 min., four members completed their "A" licence test, and five new members joined, during the week ending June 16. The two machines of the R.A.F. Flying Club put in 28 hr. 55 min. in the air and members of this Club's Committee were very busy organising the Club Display, which is fully described on another page this week.

Mr. Parker has been practising over the King's Cup course, for which the pylons at Wotton-on-Stone and Hoo End are in the course of erection.

The Auxiliary Squadrons taking part in the R.A.F. Display at Hendon on June 30 will be using the aerodrome on that day and the day preceding. The warm weather has attracted large crowds to the swimming pool and tennis courts.

## RENFREW

Members of the Scottish Flying Club put in 33 hr. 10 min. dual flying and 57 hr. 35 min. solo flying during the week ending June 15. Mr. A. C. Richmond made his first solo flight and Mr. R. S. Black passed for his "A" licence. The Club landing competition was held on June 9, the winner in the *ab initio* class was T. D. Foulds and in the open class Mr. A. M. Dunlop. The race for the Mobiloil Cup was held on June 10, the winner being F/O. A. D. Farquhar with Mr. G. C. Pinkerton second.

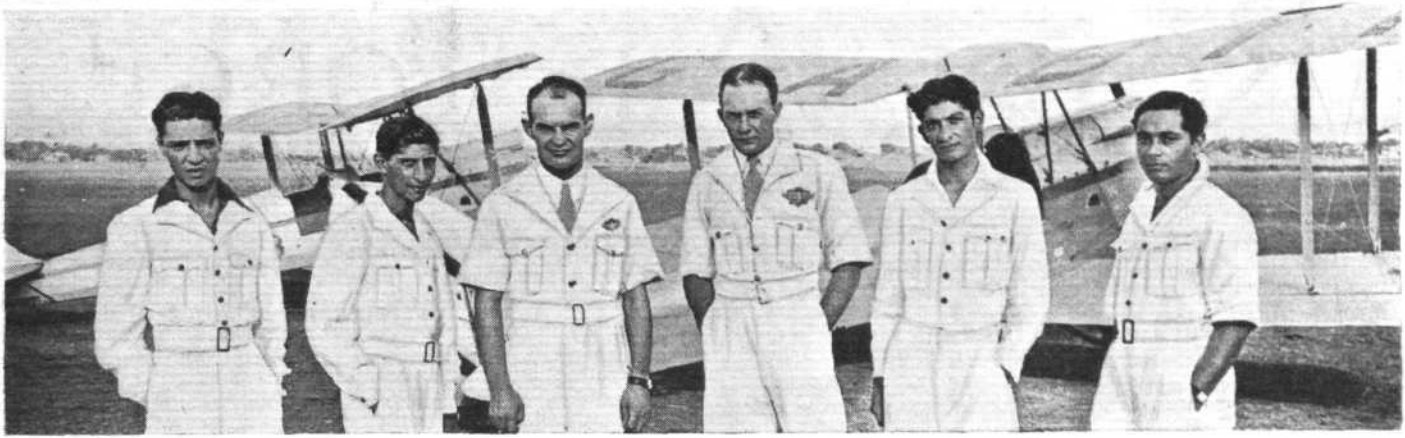
## CINQUE PORTS

Flying time for the week ending June 16 went up to 73 hr. Mr. J. E. Wheatley went solo and did his "A" licence tests. In future, owing to the increased activity, the Club will be open the full seven days a week. Messrs. Pond and Sabelli landed at the aerodrome on June 11 on their way from Heston to Rome. The Club's "Leopard Moth" has been in great demand for charter work. A party of Belgian tourists flying in two Fokkers visited the aerodrome on June 10 and returned home the same evening.



**FAST COMFORT:** Retractable undercarriage, highly tapered wings and clean lines, especially over the pilot's cockpit, are some of the many features which give the new British Klemm "Eagle" ("Gipsy Major") its fine performance. (FLIGHT Photo.)





**BOMBAY TO HESTON :** These six British and Indian members of the Bombay Flying Club are flying to England and are due to land at Heston on June 23.

## YORKSHIRE

Total flying time during the week ending June 16 at Yeadon Aerodrome was 40 hr. Yorkshire Aeroplane Club acquired a "Puss Moth" from Henlys during the week. Dr. G. Masson and Mr. W. M. Jackson made first solo flights.

## GATWICK

Pupils of the British Air Transport Flying School, which is operating temporarily at Gatwick Aerodrome, flew 151 hr. 45 min. during the fortnight ending June 15. Mr. D. Dade went solo during the week, and both he and his brother, Mr. J. Dade, passed their "A" licence tests.

## ST. ALBANS.

Mr. V. R. Dickinson is opening premises to be called the County Flying Club, which are situated close to Victoria Station, London, S.W.1. Further details can be obtained from the Secretary, 23, Tryon Street, Chelsea, S.W.3.

## HERTS AND ESSEX

Broxbourne Aerodrome was the scene of much activity during the week ending June 15, as the Club machines made up a total of 129 hr. flying time. Mr. F. B. Radford made his first solo flight and Mr. F. E. Pearce passed the tests for his "A" licence.

## HANWORTH

It is announced that the period of managership of the Receiver for National Flying Services, Ltd. (Mr. C. J. Palmour), has been extended to July 27. The Club aeroplanes spent 74 hr. in the air during the week ending June 15, and Mr. Mehta completed the tests for his "A" licence. A Klemm "Swallow" is now available for dual instruction.

## NORFOLK AND NORWICH

The preliminary heats for the Single v. Married Pilots' competition are being flown off. Contesting pilots take-off with the altimeter covered and with a sealed barograph in the locker behind the pilot. They then climb to their estimation of 2,000 ft., and from there land without using engine. Marks are awarded for landing—one point being deducted for each ten yards beyond the ground sign, those landing short not receiving any marks—and also for accurate height estimation.

On June 24 the annual competition for the President's Trophy will take place. This takes the form of a handicap cross-country contest and is open to all pilots of the Club who have passed their cross-country and forced-landing tests.

## BROOKLANDS

Flying time was even better than the previous week and totalled 108 hr. 45 min., of which 40 hr. were solo

flying. Messrs. Valetta and Sharman made first solo flights and Miss Wilmer started instruction for her "B" licence.

## FORD

Yapton Aero Club started operations at Ford Aerodrome, near Bognor, on June 19. A "Moth" and a three-seater Spartan are available for instruction and charter work.

## LIVERPOOL

Flying by members of the Liverpool and District Aero Club at Hooton Park totalled 78 hr. 45 min. for the week ending June 14.

## CAMBRIDGE

Pupils at Marshall's Flying School flew 32 hr. dual and 14 hr. solo during the week ending June 16. Several air taxi trips were also made.

## BIRMINGHAM

Members of the Midland Aero Club put in 29 hr. 45 min. dual flying and 23 hr. solo flying time at Castle Bromwich Aerodrome during the week ending June 14. Mrs. H. Dance and Messrs. A. Devoti and S. Goodman joined the Club.

## CARDIFF

There were eight entries for the Cardiff Aeroplane Club landing competition on June 10, the winner being the Chief Instructor, F/O. W. N. L. Cope. All new flying members will, in future, be given a free hour of dual instruction. Flying instruction will be started next week at Wenvoe Aerodrome, Cardiff, by South Wales Airways, Ltd. Instruction will be given on "Moths" by Mr. R. H. Thomas.

## HAMPSHIRE

Flying time during the week ending June 16 by members of the Hampshire Aeroplane Club at the Southampton Municipal Airport was 76 hr. Mr. E. H. Davies made his first solo flight and qualified for his "A" licence, the latter accomplishment also being achieved by Messrs. A. Gifford and B. I. O'Donnell.

## COVENTRY

It is now proposed to include gliding among the activities of the Coventry Aviation Group. The use of a "Zögling" glider has been obtained and it is intended that practice should start immediately.

## INDIA AND BURMA

On June 30 the Secretary of the Aero Club of India and Burma, Wing Com. A. R. C. Cooper, is retiring, and his successor will be Flt. Lt. Gordon V. Carey, at present serving with the R.A.F. at Singapore. Wing Com. Cooper has held the appointment for five years.

## VISITS FROM FOREIGN PRIVATE OWNERS

A large number of private owners from most of the European countries have accepted the invitation of the Hospitality Committee of the Royal Aero Club for the week-end June 29-July 2. The programme includes a Cocktail Party at Grosvenor House on Friday, June 29, as guests of Lady Elibank. Saturday, June 30, will be devoted to the Royal Air Force Display at Hendon, after which the guests will stay with English private owners. On Monday, July 2, the male visitors of the party have

been invited to the S.B.A.C. display of British aircraft at Hendon.

Amongst the members of the Hospitality Committee who will be entertaining the visitors are:—Mr. Lindsay Everard, M.P., Mrs. Alan S. Butler, Mrs. Nigel Norman, Air Vice Marshal A. E. Borton, Maj. J. D. Shaw, Mr. G. H. Wilson-Fox, Mr. H. Gordon Selfridge, Jr., Mr. T. E. L. Guinness, M.P., Lord Amherst, Capt. J. Davenport, Mr. G. H. B. Shaw.

# THE ROYAL AIR FORCE



London Gazette, June 12, 1934.

## General Duties Branch

The short service commn. of Pilot Officer on probation B. O. Prowse is terminated on cessation of duty (June 11).

## ROYAL AIR FORCE RESERVE RESERVE OF AIR FORCE OFFICERS

### General Duties Branch

F/O. C. R. A. Page is transferred from Class C to Class BB (May 25).  
Ft. Lt. E. D. Cummings, D.F.C., is transferred from Class A to Class C (June 7).

The notification in the *Gazette* of Nov. 28, 1933, concerning F/O. B. A. Davy is cancelled.

The following relinquish their commns. on completion of service, and are permitted to retain their rank:—Ft. Lt. M. D. Barber (June 8); F/O. S. A. Dismore (May 15).

The following F/Os. relinquish their commns. on completion of service:—G. J. C. Mahony (March 31); R. Matheson (April 22); E. J. Dillnutt (June 2).

## ROYAL AIR FORCE INTELLIGENCE

**Appointments.**—The following appointment in the Royal Air Force are notified:—

### General Duties Branch

*Flight Lieutenants:* N. L. Desoer to D. of O., Dept. of C.A.S., Air Ministry, 7.6.34. C. F. H. Grace to No. 47 (B) Squadron, Khartoum, Egypt, 23.5.34.

*Flying Officers:* T. N. Coslett to Armament Training Camp, Leuchars, 25.4.34. W. C. Pitts to Armament Training Camp, Leuchars, 15.5.34. J. Coverdale to No. 14 (B) Squadron, Amman, Palestine, 21.5.34.

*Pilot Officer* W. D. Woods to No. 3 Flying Training School, Grantham, on appointment to a Permanent Commission.

### Stores Branch

*Flight Lieutenant* P. P. S. Rickard to School of Naval Co-operation, Lee-on-the-Solent, 7.6.34.

The commn. of P/O. on probation G. M. Bardolph is terminated on cessation of duty (May 1).

F/O. M. F. Peacock relinquishes his commn. on appointment to a commn. in the Auxiliary Air Force (May 29).

## AUXILIARY AIR FORCE

### General Duties Branch

No. 600 (CITY OF LONDON) (BOMBER) SQUADRON.—F/O. W. H. Wetton relinquishes his commn. on completion of service (April 8).

No. 601 (COUNTY OF LONDON) (BOMBER) SQUADRON.—M. F. Peacock is granted a commn. as Pilot Officer (May 29).

No. 605 (COUNTY OF WARWICK) (BOMBER) SQUADRON.—F/O. J. F. Gummow relinquishes his commn. on completion of service (June 13).

In the *London Gazette* of June 8, published in *The Times* on June 9, the last three names in the first paragraph under "Regular Army" (S. Griffin, D. K. Weston, and J. Davidson), should have appeared under "Royal Army Medical Corps," following that of J. E. Moody, as having been promoted from Lieutenants to Captains (May 1).

*Flying Officers:* J. W. Stokes to Administrative Wing, Halton, 7.6.34. A. J. Howell to Station Headquarters, Ismailia.

### Accountant Branch

*Flying Officer* J. E. Gregson to Station Headquarters, Ismailia.

### Medical Branch

*Flying Officers:* J. A. Crockett to No. 5 Flying Training School, Sealand. W. P. Griffin to No. 84 (B) Squadron, Shaibah, Iraq.

### Dental Branch

*Flying Officer* W. V. A. Denney to Royal Air Force Depot, Uxbridge.

# ROYAL AIR FORCE DISPLAY

## Prince of Wales Attending

**H.** R.H. THE PRINCE OF WALES will represent H.M. the King at the Royal Air Force Display at Hendon on Saturday, June 30. His Royal Highness is an Air Marshal in the Royal Air Force and is also Honorary Air Commodore-in-Chief of the Auxiliary Air Force.

Nearly all the members of the Diplomatic Corps will be present, including the Ambassadors of France, Germany, Italy, Japan and Russia. Several members of the Cabinet, in addition to the Marquess of Londonderry, Secretary of State for Air, are attending, amongst them being Mr. J. H. Thomas, Sir Godfrey Collins and Sir E. Hilton Young. Previous Secretaries of State for Air will include Lord Weir, Lord Amulree, Mr. Winston Churchill, M.P., and Air Commodore F. E. Guest, M.P., while former Under-Secretaries will be represented by Lord Stonehaven, the Duke of Sutherland and Maj. G. C. Tryon, M.P. Sir Eric Geddes, Chairman of Imperial Airways, will also be there.

The plans for the Royal Air Force Display include a special exhibition of aircraft equipment. The exhibits will be on view in the sheds near the main entrance in Colindale Avenue. It will be open during the day to holders of 10s. enclosure tickets on payment of a small admission fee of 6d. After the completion of the flying programme, spectators in the other enclosures will also be able to see the exhibits on payment of the same fee. The exhibition has been organised by the Display Committee in the belief that many visitors are interested in the vast field of research, experiment and manufacture from which the exhibits will be drawn as well as in actual flying. There will be demonstrations of various methods followed by the design and research experts, and the ultimate interpretation of their achievements produced in standard and usable form by the manufacturers. The practical application of small scale models employed in the process of research, experiment and design will be shown. The many items of intricate mechanism which are carried inside an aeroplane will be displayed for examination. Cinematograph films of interesting flights and experiments will also be exhibited continuously. In addition to the purely Service exhibits, the principal aircraft, aero-engine and accessory manufacturers in Britain have provided specimens of their products.

## Wonderful Flying by Fighter Squadrons

No. 25 (Fighter) Squadron, which is stationed on the coast at Hawkinge for home defence interceptor duties, will perhaps provide the most thrilling events in the Display. The nine "Fury" aircraft are all linked together by light cables, to which streamers are attached, and the least inaccuracy in flying will break the cables prematurely. They have evolved many new evolutions which have not been seen before.

The whole squadron will loop, both in line abreast and in Vee formation, and the superb quality of their control will be most effectively demonstrated in carrying out complete turns while flying in line and in squadron V. The inner machine is necessarily flying almost at stalling point, while the outer is turning at over 200 m.p.h.

Synchronised flight aerobatics will be given for the first time this year by six pilots of No. 43 (Fighter) Squadron, Tangmere. This unit is also equipped with "Fury" aircraft for interceptor duties. Their manoeuvres call for absolute air discipline, exact judgment of speed and complete and precise control must be maintained by each pilot over his aircraft. Simultaneously, the two flights will carry out a series of amazing evolutions, including half rolls, rocket loops and complete rolls by flights.

Another variation of aerobatics will be given by No. 19 Squadron, Duxford, which is equipped with "Bulldog" day and night fighters. The five aircraft have had smoke apparatus specially installed, and the pilots will trace in the sky several intricate patterns, using the R.A.F. colours, red, white and blue, in smoke. Amongst the more complicated are the Prince of Wales' feathers, true lovers' knots, and the St. Catherine's wheel.

Tickets for the Royal Air Force Display are now on sale at all theatre agencies and libraries, and may also be obtained from the Secretary of the Air Force Display at Hendon (Colindale 8242). Boxes to seat six are priced £4, £5 and £7 and tickets for the special enclosures cost 10s. and 5s. Reserved seats in the stands in these enclosures are 3s. and 2s. 6d. *extra*. Tickets for the 2s. enclosure can only be obtained at the gates on the day of the Display.

The proceeds of the Display are devoted to Service charities, including the Royal Air Force Benevolent Fund.



# SERVICE NOTES

## New Zealand Permanent Air Force— Change of Title

THE title "New Zealand Permanent Air Force" has been changed to "Royal New Zealand Air Force."

## Visits to the Bristol Aeroplane Company

THE attention of all pilots is drawn to the necessity of reporting to the Duty Pilot, No. 501 (Bomber) Squadron, whenever they are using Filton Aerodrome. Considerable inconvenience is being caused by pilots failing to comply with the above procedure when delivering aircraft to, collecting aircraft from, or visiting the Bristol Aeroplane Company at Filton.

## Salonika Army and Black Sea Forces Annual Dinner

THE thirteenth annual dinner of the Salonika Army and Black Sea Forces will be held at the Café Royal, 68, Regent Street, London, W.1, on Friday, June 22. Field Marshal The Lord Milne, G.C.B., G.C.M.G., D.S.O., Colonel Commandant, R.A., will preside. Tickets, 15s. 6d. each (exclusive of wines), may be obtained from Maj. Elliott Bell, Hon. Secretary, Salonika Army and Black Sea Forces Dinner, 68, Regent Street, London, W.1, to whom all communications should be addressed.

## A Correction

AN error crept into the caption of the photograph of "Instructional Aircraft" in the article on "Cranwell" last week. An "Atlas" was inadvertently described as a two-seater "Siskin." One flight cadet writes to us to say that on seeing this "I received a shock which sent a shudder down my spine," and adds that "it seems astounding that such a worthy paper as *FLIGHT* should make such a mistake." We take it as a high compliment that our readers should look on us as infallible, and we hope that our correspondent's spine will soon recover its normal rigidity.

## Transfer of Officers to the Reserve

THE undermentioned short service, medium service and non-permanent officers should note that they become due on the dates stated for transfer to the reserve, on completing their period of service on the active list:—

DECEMBER, 1934—JANUARY, 1935

### GENERAL DUTIES BRANCH

Flt. Lt. Albert John Holmes. (January 17.)

F/Os. William Bernard Bailey, John Bamber, Clement William Walter Sydney Conway, Leslie Edward Dalrymple, Edwin Elgey, Cecil Joseph Farrell, Edwin Mackenzie Gurney, George James Holland, Lionel William Vaughan Jennens, Arthur William Rupert Lawson, Robert Paul Joseph Leborgne, Douglas Webster Lucke, Richard Angus McMurtrie,\* Richard James Robert Haldane Makgill, William Cooke Pitts, William Theodore Ratcliffe, Basil Pelham Reynolds, Leslie Eric Bradley Stonhill, Maurice Francis Summers, William Barrett Thompson, Gordon Rutherford White, Allen Roy Wilson. (December 27.)

### MEDICAL BRANCH

Flt. Lts. Francis Wilfrid Peter Dixon, M.B., B.S.,† Colin Russell Palfreyman, M.B., B.S.,† (December 1.) Jack Anthony Kersley, M.R.C.S., L.R.C.P.,† Douglas Currie MacGilchrist, M.B., Ch.B.,† (January 18.) Roland Lionel Raymond, M.B., Ch.M., F.R.C.S.(E.)† (January 25.)

### DENTAL BRANCH

Flt. Lts. Ernest Sharp, L.D.S.† (December 14.) Patrick Joseph Clifford Keane, L.D.S.† (January 4.)

Statements from the officers marked "†," indicating whether or not they desire to be considered for an extension of service to five years on the active list, are to be forwarded forthwith, together with recommendations if the statements are in the affirmative.

Flying reports are to be rendered in respect of the general duties branch officers, except the one marked "\*" (who has been selected provisionally for a permanent commission).

## A.A.F. Annual Training, 1934

THE following additional training during 1934 will be carried out:—One flight of No. 607 (County of Durham) Squadron, September 1 to 15, at Leuchars.

## Examination of applicants for Ground Engineers' Licences

WITH reference to paragraph 1 of Notice to Aircraft Owners and Ground Engineers No. 15 of 1934, the Examination Boards notified therein to be held in London, Croydon and Manchester, during the month of August, 1934, have been cancelled. The Boards will be resumed in September, but a further Notice will be issued notifying the exact dates on which the Boards will be held.

## Telling the Taxpayer

ON Saturday, June 23, No. 26 (Army Co-operation) Squadron, which is stationed at Catterick, Yorkshire, will pay a visit to Blackpool and give the public an opportunity of inspecting their Hawker "Audax" machines (R.R. "Kestrel"). The hooks for picking up messages, which are attached below the fuselage of Army Co-operation aeroplanes, always arouse considerable interest, and, generally speaking, it is a good thing to give the public some idea of each form of R.A.F. work.

## R.A.F. Lawn Tennis Association

THE R.A.F. Lawn Tennis Championships will be held at the West Side Country Club, Ealing, from Monday, July 16, 1934, to Friday, July 20, 1934.

The Airmen's Lawn Tennis Championships will be held at Halton from Monday, July 30, to Friday, August 3, 1934, inclusive. A cup for the Singles Championship, presented by the Rt. Hon. Sir Samuel Hoare, Bt., G.B.E., C.M.G., M.P., will be competed for. A replica will be given to the winner and a prize to the runner-up. Entrance fee, 2s. 6d.

The Inter-Services Lawn Tennis Championships will be held at Wimbledon on Monday and Tuesday, August 6 and 7, 1934.

## Temporary Closing of R.A.F. Stations

THE following R.A.F. stations will be closed during the periods stated while the units are absent on leave or at the armament training camps on the East Coast. Between these dates aircraft should land only in cases of emergency.

Western Area.—Worthy Down, now to June 24; Aldergrove, July 15 to 28; Waddington, July 22 to August 4 and October 1 to 21.

Central Area.—Abingdon, June 17 to July 8 and July 30 to August 26; Bicester, July 1 to 22 and July 30 to August 22; Upper Heyford, August 27 to October 21; Bircham Newton, July 30 to August 26; Hucknall, July 22 to August 4 and August 8 to 30; Filton, July 22 to August 4 and August 10 to 23.

Fighting Area.—Duxford, July 16 to September 10; Hornchurch, July 30 to August 26; Biggin Hill, now to June 24 and August 6 to 26; Upavon, August 27 to September 17; Hawkinge, July 15 to 22 and August 4 to September 10; Tangmere, August 12 to 26; Kenley, August 27 to September 16; North Weald, August 20 to 27.

Auxiliary Air Force.—Abbotsinch, July 13 to 27; Turnhouse, July 22 to August 5; Castle Bromwich, August 5 to 19; and Thornaby, August 11 to 26.

## Salvage and Repair of Technical Stores

IN order to promote the study of the most efficient methods of salvage and the possibilities of salvage and further utilisation of all categories of materials, it has been decided to provide facilities at No. 3 Stores Depot, Milton, and No. 4 Stores Depot, Ruislip, for the training of certain officers in these aspects of salvage and repair work. Short courses of 28 days' duration will be held at the Stores Depot at Milton, followed by attachment to the Stores Depot at Ruislip for a period of five days.

As far as possible all "E" specialists will be required to attend this course either during the first tour of "E" employment or on the first re-appointment to specialist duty following a period of non-specialist employment, and the selection of these officers will be made by the Air Ministry.

It is also anticipated that vacancies will be available for officers of the general duties branch other than those mentioned above.

It is not proposed to establish these courses at definite periods throughout the year, but arrangements will be made having regard to the facilities available at the stores depôts in question.

# CORRESPONDENCE

*The Editor does not hold himself responsible for opinions expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters intended for insertion in these columns.*

## THE MACROBERTSON AIR RACE

[2935] Estimates of performance of probable entrants have been given in such a casual and airy way that perhaps you will allow me a few lines in which to indicate that it is easier to talk about these performances than to obtain them.

Owing to the importance of landing as seldom as possible in this race, there is great value in long range. There is no room for miracles here. I believe the best range which can be got on any existing civil aircraft, when its weight is limited by the prescribed take-off and structural requirements, is about 2,500 miles. Since this would be obtained by stripping it of equipment and other load, and flying at the economical speed, the difficulty of reaching such figures under racing conditions will be obvious at once.

The problem resolves itself into getting the highest speed for the power used, and it is not possible to say that any aircraft can lift sufficient petrol while keeping within the take-off and structural limitations to fly 2,500 miles at 200 m.p.h. in one hop until it has been demonstrated by tests. It would be well beyond anything so far achieved.

This contest is a very different proposition from the numerous noteworthy flights which have been achieved by overloading machines beyond what their passenger-carrying certificates would permit. It seems a pity to arouse expectations in the public mind by means of guesses which do not take into account the limits within which the aircraft must function, although people connected with aircraft design are familiar enough with these things to take them at their proper value.

C. C. WALKER  
(De Havilland Aircraft Co., Ltd.).

Stag Lane,  
Edgware.

## SUBSIDIES FOR GLIDING

[2936] The leading article in your issue of last week comes at an opportune moment. As you probably know, an advanced gliding site of very much the same kind as the Hornberg School in Germany, has just been acquired by the British Gliding Association at Sutton Bank, in Yorkshire, and is now being equipped with hangar and other facilities. The financial difficulty is acute, but enough money has been raised within the movement itself for the bare necessities, and once such a centre has been established it will be possible quickly to expand it when and if the financial question has been overcome.

The really urgent need of the moment is, as you remark, for permanent paid instructors. But there is little hope that from their own resources the clubs will be able to afford them. The entire annual income of the London Gliding Club, on which many hundreds of hours of flying are done each year, would hardly provide decent income to a couple of paid instructors. Yet now, with a good and well-equipped school site at Dunstable, and a second "University" high-efficiency site at Sutton Bank, a permanent instructor at each would result in literally dozens of first-class pilots and/or instructors being turned out annually.

In the one day's competitions held at Sutton Bank last October, nearly 50 hours' flying was done by a dozen machines, and in one week at Dunstable nearly 100 hours, totals which put most light aeroplane clubs to shame.

In your article you say that there is probably not in England a site as good as the Wasserkuppe in Germany. That is not so, I could mention two or three; but near London, the South Downs offer sites which in some conditions are better than anything so far developed in Germany. Yet the South Downs Preservation Bill now under consideration will, if passed, lose this priceless and irreplaceable asset to the future of the movement in this country for ever.

The sort of answer one gets to one's protests is: "Well, we didn't really mind gliders on the edge of the Downs, but, if we allow them, we can't stop motor race tracks"—which is as poor an argument as it is a consolation. That is the sort of thing we are up against, our enthusiasm being equalled only by our poverty.

Gliding is a more tender plant than power flying for the reason that sites from which it can be practised are fewer; if it is to grow we must see that what sites Nature does offer are not closed by short-sighted and mis-directed local laws and lack of influential support.

PHILIP WILLS,  
Hon. Treasurer,  
British Gliding Association.

# The Industry

## A MATTER OF PRICE

WE are requested to state the price of the Klemm "Eagle" three-seater offered by Wrightson Aircraft Sales, Ltd., is £1,375 and not £1,300.

## NORMAN MUNTZ & DAWBARN

MR. GRAHAM DAWBARN, partner in the above firm of aeronautical consultants, has removed his office to 43, Grosvenor Place, S.W.1. (Sloane 5161.)

## A WEIR APPOINTMENT

MR. CYRIL G. PULLIN has taken up a position with G. & J. Weir, Ltd., of Cathcart, Glasgow. Mr. Pullin will be remembered as the designer of the Douglas "Dryad" engine installed in the small single-seater Autogiro with a rotor of two blades only, which is the prototype from the Weir factory. This appointment seems to foreshadow the production of engines in that factory in the future.

## B.E.N. PATENTS, LTD.

OWING to expansion of business, B.E.N. Patents, Ltd.—who specialise in spraying plant for dope—have appointed Mr. A. G. Roper as Assistant Sales and Service Manager at their head office at Gorst Road, Park Royal, N.W.10. Mr. Roper was previously in charge of the Tottenham Court Road Showrooms, and his place there has been filled by Mr. A. Keall.

## HAMILTON V.P. AIRSCREWS

FURTHER to our note last week regarding the Hamilton variable-pitch airscrews—the manufacturing licence and selling rights for which have just been obtained by the de Havilland Aircraft Co., Ltd.—it may be of interest to note that the Collier Trophy (the highest award in American aviation) has been awarded to the Hamilton Standard Propeller Co., of Hartford, Connecticut, "for the development and demonstration of a controllable-pitch propeller now in general use."



## NEW COMPANIES REGISTERED

INDUSTRIAL FLIGHT, LTD., Hawthorndene, Park Road, Worthing.—Capital £5,000 in £1 shares. To carry on the business of light and heavy mechanical, electrical, marine, research, and experimental engineers, patentees, designers and manufacturers of aeroplanes and automobile engines, parts and accessories, builders and manufacturers of aeroplanes, etc. The directors are: Kathleen M. Stenning, 11, Pembroke Gardens, Kensington, W. Alice Stenning, 119, Park Road, Worthing, Sussex. Geoffrey A. Stenning, 119, Park Road, Worthing, Sussex. Solicitors: Winfields, Halse & Trustram, 61, Cheapside, E.C.2.



## PATENT AERONAUTICAL SPECIFICATIONS

Abbreviations: Cyl. = cylinder; i.c. = internal combustion; m. = motors (The numbers in brackets are those under which the Specification will be printed and abridged, etc.)

### APPLIED FOR IN 1932

Published June 21, 1934

- 32,409. J. M. LADO-BORDOWSKY. Aircraft. (410,747.)  
32,750. BRITISH AEROPLANE CO., LTD., and H. J. POLLARD. Aeroplane wings and like aerofoil structures. (410,750.)

### APPLIED FOR IN 1933

Published June 21, 1934.

- 17,336. FAIREY AVIATION CO., LTD., and D. L. H. WILLIAMS. Means for dropping bombs from aircraft. (410,979.)

### APPLIED FOR IN 1934

Published June 21, 1934

- 1,046. R. HAYES. Engineless monoplane or glider manually propelled. (411,063.)